A

SUPPLEMENT

TO THE

MISCELLANEOUS

WORKS

Of the Late

Dr. Arbuthnot.

G L A S G O W :

TO THE

PUBLICK.

SINCE the Publication of
the Two Volumes of this
Author's Works, fome Gentlemen
have been fo gracious to affift us
with the Pieces mark'd· with an
Afterifm, which in Juftice to the
Publick we prefent them with
gratis.

A

SUPPLEMENT, &c.

The Freeholder's Political Catechism.

Anno 1733.

Queſtion, **WHO** are you?
Anſwer, I am *T. M.* a Free-
holder of *Great Britain.*
·Q. *What Privilege enjoy'ſt thou
by being a Freeholder of* Great Britain ?
A. By being a Freeholder of *Great Britain,* I
am a greater Man in my Civil Capacity, than the
greateſt Subjeсt of an Arbitrary Prince ; becauſe I
am govern'd by Laws, to which I give my Conſent,
and my Life, Liberty, and Goods, cannot be taken
from me, but according to thoſe Laws : I am a
Freeman.

Q. *Who gave thee this Liberty ?*
A. No Man gave it me : Liberty is the Natural
Right of every Human Creature ; he is born to
the Exercife of it as foon as he has attained to that
of his Reaſon ; but that my Liberty is preferved to
me, when loſt to a great part of Mankind, is owing
under God to the Wiſdom and Valour of my An-
ceſtors, Freeholders of this Realm.

Q. Does

Q. *Does not every Man give up his Liberty, to the Government of the Political Society, whereof he is a Member ?*

A. Mankind give up some part of their Natural Liberty to the Government for the Benefit of Society and mutual Defence (for in Political Society an Infant has the whole Force of the Community to protect him) but no Man can make himself a Slave.

Q. *Why ?*

A. Because no Man can give an absolute Dominion over his Life, for that is not in his Power and belongs only to his Creator.

Q. *How comes it then that the Civil Magistrate has a Right to take away Lives ?*

A. Because by the Laws of Nature, every Man has a Power of taking away the Life of another in Self-defence, which Power is given up to the Magistrate, and which Power returns to every Man, when the Magistrate cannot defend him, as in the Cafe of being attack'd with sudden and lawlefs Violence.

Q. *Has not the Magiftrate a Power to compel thee to be of what Religion he thinks fit.*

A. No, Because neither in the State of Nature, nor in the State of Civil Society, has any Man an absolute Power over another Man's Mind or Conscience; from whence it follows, that in the first of those States, no Man could give the Magiftrate a Power which he hath not to give: and that in the Second of those States, the Exercise of this Power is impoffible; Compulfion without Conviction making a Man an Hypocrite, that is a Criminal, but can never secure the publick Peace.

Q. *Wherein does this Liberty which thou enjoyeft confift?*

A. In Laws made by the Confent of the People,

and

and the due Execution of thofe Laws; I am free not from the Law, but by the Law.

Q. Wilt thou ſtand faſt in this Liberty whereunto thou art born and entitled by the Laws of thy Country ?

A. Yes verily, by God's Grace I will ; and I thank his good Providence that I am born a Member of a Community governed by Laws and not by Arbitrary Power.

Q. What do'ſt thou think incumbent upon thee to ſecure this Bleſſing to thyſelf and Poſterity ?

A. As I am a Freeholder, I think it incumbent upon me, to believe aright concerning the fundamental Articles of the Government to which I am ſubjeᶜt; to write, ſpeak, and aᶜt on all Occaſions conformably to this Orthodox Faith, to oppoſe with all the Powers of my Body and Mind, ſuch as are Enemies of our good Conſtitution, together with all their ſecret and open Abettors, and to be obedient to the King the ſupreme Magiſtrate of the Society.

Q. Rehearſe unto me the Articles of thy Political Creed ?

A. I believe that the Supreme or Legiſlative Power of this Realm reſides in the King, Lords, and Commons ; That his Majeſty King *George* the Second is Sovereign or Supreme Executor of the Law, to whom upon that account all Loyalty is due. That each of the three Members of the Legiſlature are endowed with their particular Rights, and Offices ; that the King by his Royal Prerogatives has the Power of determining and appointing the Time and Place of Meeting of Parliaments. That the Conſent of King, Lords, and Commons, is neceſſary to the Being of a Law, and all the three make but one Lawgiver. That as to the Freedom of Conſent in making of Laws, thoſe three Powers are

are independent, and that each and all the three are bound to obferve the Laws that are made.

Q. *Why is the Legiflative Power Supreme ?*

A. Becaufe what gives Law to all, muft be Supreme.

Q. *What mean'ft thou by Loyalty to the King ?*

A. I have heard that *Loy* fignifies Law ; and Loyalty, Obedience, according to Law; therefore he who pays this Obedience is a loyal Subject, and he who executes the King's Command when contrary to Law is difloyal and a Traitor.

Q. *Is it not a Maxim in the Law, that the King can do no Wrong ?*

A. It is : For fince Kings do not act immediately by themfelves, but mediately by their Officers, and inferior Magiftrates ; the Wifdom of the Law provides fufficiently againft any undue Exercife of their Power, by charging all illegal Acts, and all kinds of Male-Adminiftration upon their Minifters : by the great regard which is paid to the King by this Maxim, laying him under an indifputable Obligation, not to fkreen his Minifters from Publick Juftice or Publick Enquiry.

Q. *What do'ft thou mean by the Royal Prerogative ?*

A. A Difcretionary Power in the King to act for the Good of the People where the Laws are filent, never contrary to Law, and always fubject to the Limitations of the Law.

Q. *Doeft thou owe no other Duty to the King but Obedience according to Law ?*

A. Yes. I am bound to pray for him, to honour him, to behave myfelf refpectfully towards him, and to fpeak refpectfully of him, as it is written, *Thou fhalt not fpeak Evil of the Ruler of the People.*

Q. *Thou haft promifed that in order to preferv this thy Liberty, thou wilt refift to the utmoft of th Power the Enemies of our good Conftitution ; who ar thofe Enemies ?*

A. Su

A. Such as deny the Title and Authority of the King who is acknowledg'd to be so by the Legislature: Such as by the Heretical Doctrines exalt the Royal Authority above the Laws: Such as endeavour to destroy the Authority and Independence of any of the three Members of the Legislature.

Q. *How comes it that denying the Title and Authority of the King, who is acknowledged by the two Branches of the Legislature, is subverting a fundamental Law of the Constitution?*

A. Because if private Judgment is to be oppesed to that of the Publick, there can be no Peace in that Society: Besides every Man in the Society is supposed to have given his Assent in that Matter already, for the Act of the Majority is the Act of every Individual.

Q. *What are those Heretical Doctrines which exalt the King's Authority above the Laws.*

A. Asserting, That there is something particularly Divine in Kingly Government, as being the first Government of the World, and appointed by God. And that there is in Kings an Authority and Hereditary Right of Succession independent of the Laws.

Q. *How canst thou prove those to be heretical and false Doctrines?*

A. Because they are so far from being founded upon Scripture (as is pretended) that they are contrary to it. For first, It does not appear from Scripture how the first Political Societies were formed. Secondly, The first Government of God's People was not Monarchical; the Patriarchs were not Kings; the Government of the *Ifraelites* before *Saul's* Time was Republican; the People sent Ambassadors, *Joshua* xxii. the People in full Assembly demands Justice, *Judges* xix and xx. Thirdly, God Almighty gives a disadvantageous Character of Absolute

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folute Monarchy, which fee 2 *Sam.* viii. 4. If by
God's Appointment, be meant a Divine Revelation
or Miffion, no Monarch upon Earth has it: If by
God's Appointment be meant the Divine Authority,
enjoyning Obedience to the lawful Ordinances of
Man, the Supreme Power of a Commonwealth has it
as much as a King: If by God's Appointment be
meant God's Providence, a Robber, Tyrant, U-
furper may be faid to be fo. Fifthly, There are
feveral Paffages in Scripture, that favour the Ori-
ginal Power of the People. *Abraham* demands a
Burrying-place for *Sarah* of the People. The firft
Governors feem to have been Captains chofen for
their Valour, by the People, *whoever will give Bat-
tle* (fay the Princes and People of *Gilead*) *to the
Children of Ammon, fhall be Head over the Inheritance
of Gilead*, accordingly *Jeptha* was chofen. God
Almighty demands the Confent of the People even
to his own Laws, accordingly *Mofes* propofeth them
in a full Affembly, and demands their Confent as to
a Covenant, *See Deut.* 5. God Almighty conde-
fcended to this Natural Right of the People in
changing the Form of their Government (tho' con-
trary to his Admonition) when they demanded a
King to rule over them, and commands *Samuel* to
hearken to the Voice of the People, 2 *Sam.* viii. There
are many more Proofs of this Truth to be found in
Scripture, by any Man who reads with Atten-
tion.

Q. *Does not Conqueft give a Right to abfolute Mo-
narchy ?*

A. No : For unjuft Force can never give any
juft Dominion : And Conqueft in a juft War, gives
the Conqueror abfolute Dominion only over the In-
dividuals he has fubdued.

Q. *What thinkeft thou of Hereditary Right ?*

A. No

A. No Man can have Hereditary Right by the Title of King, for there are Kingdoms Elective; ſeveral Kingdoms have different Cuſtoms and Laws in determining the Succeſſions of their Monarchs; thoſe of *Britain* and *France* are different, and both from the Cuſtoms of ſome other Monarchies; therefore there can be no Right of Succeſſion but by the Laws of the Land, and accordingly by the Act of Settlement his preſent Majeſty King *George* the Second has an Hereditary Right in himſelf and lineal Deſcendants, ſubject to the Lmitations of the Law, a more authentick Deed for Hereditary Right, than can be produced by any Prince in the World.

Q. *Is not then the King above the Laws ?*

A. By no means : For the Intention of Government being the Security of the Lives, Liberties, and Properties, of the Members of the Community, they never can be ſuppoſed by the Law of Nature, to give an Arbitrary Power over their Perſons and Eſtates. King, is a Title, which tranſlated into ſeveral Languages, ſignifies a Magiſtrate with as many different Degrees of Power, as there are Kingdoms in the World, and he can have no Power but what is given him by Law; yea, even the Supreme or Legiſlative Power, is bound by the Rules of Equity, to govern by Laws enacted, and publiſhed in due Form; for what is not Legal is Arbitrary.

Q. *How comes it that thoſe who endeavour to deſtroy the Authority and Independance of any of the Branches of the Legiſlature, ſubvert the Conſtitution ?*

A. By the fundamental Laws of the Conſtitution, the free and impartial Conſent of each of the

three Members is neceſſary to the Being of a Law, therefore if the Conſent of any of the Three is·wilfully omitted, or obtain'd by Terror or Corruption, the Legiſlature is violated ; and inſtead of three there may be really and effectually but one Branch of the Legiſlature.

Q. *Can thou illuſtrate this by any Example.*

A. The Royal Authority and that of the Houſe of Peers were both deſtroyed by the Houſe of Commons, and by a ſmall Part of That, in the late Civil War ; ſo that the very Form of Government was annihilated.

Q. *Can you give me an Inſtance where the Form of Government may be kept, and yet the Conſtitution deſtroyed ?*

A. Yes. The Forms of the Free Government of *Rome*, were preſerved under the Arbitrary Government of the Emperors : There was a Senate, Conſuls, and Tribunes of the People ; as one might ſay King, Lords, and Commons, and yet the Government under the Emperors was always Deſpotick, and often Tyrannical ; and indeed the Worſt of all Governments is Tyranny ſanctify'd by the Appearance of Law.

Q. *By what Means fell that great People into this State of Slavery ?*

A. I have read the *Roman* Hiſtory, and by what I can judge, it was by Faction, Corruption, and Standing Armies.

Q. *All That might happen to* Romans; *but did ever any Parliament of this Nation give up the Liberty of the Peop'e ?*

A. Yes : A Pack'd Parliament in *Richard* the Second's Time, eſtabliſhed by a Law, the King's Arbitrary Power, and with Leave to name a Commiſſion with Parliamentary Authority.   Par-

liaments in *Henry* the Eighth's Time were Slaves to
his Paffions, and One gave the King a Legiflative
Authority. And there are many Inftances of Par-
liaments making dangerous Steps towards the De-
ftruction of the Liberty of the People.

Q. *Who were the Englifh Monarchs who were moft
indulgent to the Liberties of the People?*

A. The great King *Alfred,* who declar'd, *That
the Englifh-Nation was as free, as the Thoughts of
Man.* The glorious Monarchs, *Edward* the Firft,
Edward the Third, and *Henry* the Fifth, who
would not let his People fwear to him till he
had an Opportunity of fwearing to them, at his
Coronation. And the Immortal Queen *Elizabeth,*
who declar'd it by Law, High Treafon, during her
Life, and a *Premunire* afterwards, to deny the
Power of Parliament in limiting and binding the
Defcent or Inheritance of the Crown, or the Claim
to it.

Q. *When were thofe flavifh Maxims of Heredi-
tary Indefeazable Right and Prerogative, fuperior
to Law, firft introduced?*

A. In the Time of *James* the Firft; who by
endeavouring to eftablifh them, laid the Founda-
tion of all the Miferies which have fince happened
to his Family; and it is the greateft Security to
the prefent Branch of it, that fuch Doctrines which
fow the Seeds of Jealoufy between the King and
his People, are by the prefent Eftablifhment quite
exploded.

Q. *What do'ft thou learn from thofe Hiftories?*

A. That a King of this Realm, in the full Pof-
feffion of the Affections of his People is greater
than any Arbitrary Prince, and that the Nation
can never be effectually undone but by a wicked
Parliament; and laftly, to be thankful to God
that under our prefent moft gracious King our
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`Conſtitution is preſerv'd entire, tho' at the ſame time there are many Circumſtances which call Loudly for Vigilance.

Q. *What are thoſe?*

A. Such as have been the Fore-runners and Cauſes of the Loſs of Liberty in other Countries, Decay of Virtue, and Publick Spirit, Luxury and Extravagance in Expence, Venality and Corruption, in private and publick Affairs.

Q. *How comes there to be a Decay of Publick Spirit, when there is more than uſual a Deſire to ſerve The Publick?*

A. If a Deſire to live upon the Publick, be a Publick Spirit, there is enough of it at this Time, when Extravagance makes People crave more, and the Adminiſtration of a Publick Revenue (perhaps treble what it was before the Revolution) enables the Crown to give more than formerly.

Q. *What do'ſt thou fear from this?*

A. That ſuch as ſerve the Crown for Reward, may in Time ſacrifice the Intereſt of the Country to their Wants; that Greedineſs of publick Money may produce a ſlaviſh Complaiſance as long as the Crown can pay ; and Mutiny when it cannot ; and in general, that Motives of Self-Intereſt will prove an improper and weak Foundation for our Duty to our King and Country.

Q. *I much rejoice to ſee a Perſon of your Knowledge and Publick Spirit ; therefore I aſk you what is the Sum and Subſtance of the Virtue of a good Citizen?*

A. The Love of our Country comprehends in it the Virtues of a good Citizen, as the Love of God thoſe of a good Chriſtian : It is the Love not only of One, but of Millions of Neighbours ; not *only of our Neighbours* now living, but of them

and

and of their Pofterity. It is an Inftinct as well
as Duty of Nature; the very Soil from which as
from a common Mother, Mankind are nourifh'd and
the laft common Repofitory of their dead Bodies,
has been reputed amongft human Creatures, as a
Bond of Union; *Jofeph* comforte1 himfelf with his
dying Breath, reflecting that his Bones fhould reft
amongft his Bretheren. I read of one *Themiftocles*
who, tho' he had been banifhed from *Greece* and
Hofpitality, and receiv'd in *Perfia*, ordered his
Corps to be carried back and buried by ftealth in
his own Country. All Nations fink and rife in pro-
portion as this Virtue prevails. When I read the
Roman Hiftory I am tranfported with Joy, and a
profound Reverence for thofe Worthies who facri-
ficed their Lives, and what was perhaps dearer to
them, to the Love of their Country. Nor is our
own Country deftitute of Examples of fuch Heroick
Virtue, of which fome have tranfmitted the glorious
Fruits to their Pofterity; and fuch as have fail'd of
that, have attain'd to a glorious Immortality, and
advanc'd the Temporal Felicity of Generations paft
and to come. The Love of our Country is both a
Moral and Religious Duty.

Q. *How do'ft thou prove That?*

A. The Love which we owe to all Mankind, is
not only allow'd but enjoin'd, in greater Degrees
to particular Societies, whereof we are Members,
as Nations, Neighbours, Kindred, Families, and
Children: There are many Precepts of the Exam-
ples in Scripture enforcing this Duty of the Love of
our Country; and holy Men of Old, as they were
endowed with a religious, feem'd proportionably
fill'd with a Publick Spirit; the *Old Teftament* is full
of fuch Examples: This was the fhining Virtue
of *Mofes*, and of all the Captains, Princes, and
Prophets

Prophets of God's People. One of the Books of the Prophets is a Lamentation for the Captivity and Defolation of *Judah*; *Woe unto me* (faid *Mathias*, 2 Maccabees ii.) *wherefore was I born, to fee the Defolation of my People.* Then he and his Sons rent their Cloths and put on Sack-cloth and Mourning; *We are ready to die*, faid the young Men, *rather than tranfgrefs the Laws of our Country.* It is faid of *Judas Maccabeus*, *That he made the Jews* bold *and ready to die for the Laws of their Country.* This Virtue was more eminent in our Bleffed Saviour than in any of the Sons of Men : He confin'd at firft the Benefit of his Gofpel and Miracles to his own Country; he heals the Centurion's Servant upon the Motive of his being a Friend to the *Jewifh* Nation; and moft tender in his Lamentation over the approaching Defolation of his Country, and his Interceffion for it with his dying Breath. St. *Paul* could ev'n wifh himfelf accurfed for his Countrymen, his Brethren, and Kinfmen after the Flefh. And I am of Opinion, that the Decay of the Publick Spirit at this time is much owing to the Decay of Virtue, and that true Religion, which is always free from Bigotry and Superftition, and a perfecuting Spirit.

Q. *What would'ft thou do for thy Country?*

A. I would die to procure its Profperity : And I would rather that my Pofterity were cut off, than that they fhould be Slaves; but as Providence at prefent requires none of thofe Sacrifices, I content myfelf to difcharge the ordinary Duties of my Station, and to exhort my Neighbours to do the fame.

Q. *What are the Duties of your Station?*

A. To endeavour as far as I am able, to preferve *the publick Tranquillity*; and as I am a Freeholder,

to give my Vote for the Candidate whom I judge moſt worthy to ſerve his Country : For if for any partial Motive I ſhould give my Vote for one unworthy, I ſhould think myſelf juſtly chargeable with his Guilt.

Q. Thou haſt perhaps but one Vote of Five Hundred, and the Member perhaps one of Five Hundred more, then your ſhare of the Guilt is but ſmall?

A. As he who aſſiſts at a Murder is guilty of Murder, ſo he who acts the loweſt Part in the Enſlaving his Country, is guilty of a much greater Crime than Murder.

Q. Is Enſlaving one's Country a greater Crime than Murder?

A. Yes: Inſomuch as the Murder of Human Nature is a greater Crime than the Murder of a Human Creature; or as he who debaſeth and rendereth miſerable the Race of Mankind, is more wicked than he who cutteth off an Individual.

Q. Why is Enſlaving Mankind murdering Human Nature?

A. Becauſe Mankind in a State of Slavery and Freedom is a different Sort of Creature ; for Proof of this I have read what the *Greeks* were of old, and what they are now in a State of Slavery.

Q. What is become of the Heroes, Philoſophers, Orators, and free Citizens of Greece ?

A. They are now Slaves to the *Great Turk.*

Q. What is become of the Scipio's *and* Cato's *of* Rome ?

A. They ſing now on the *Engliſh* Stage.

Q. Does not the Tranquillity occaſioned by abſolute Monarchy make the Country thrive ?

A. Peace and Plenty are not the genuine Fruits of abſolute Monarchy ; for abſolute Monarchies are more ſubject to Convulſions, than free Governments ;

ments, and Slavery turnetn tne fruitful Plains into
a Defart; whereas Liberty, like the Dew from
Heaven, fructifieth the barren Mountains.   This I
have learn'd from Travellers, who have vifited
Countries in both Conditions ; therefore as I faid
before, I fhould reckon myfelf guilty of the greateft
Crime human Nature is capable of, if I were any
ways acceffary to the enflaving my Country ; tho' I
have but one Vote, many Unites make a Number,
and if every Elector fhould Reafon after the fame
manner, that he has but one ; what muft become
of the whole ? a Law of great Confequence, and
the Election of the Member who voteth for
that Law, may be both carried by one Vote ; great
and important Services for the Liberties of their
Country, have been done by ordinary Men : I have
read, that the Inftitution of the Tribunes of
Rome, or the whole Power of the Commons, was
owing to a Word fpoke in feafon by a common
Man.

Q. *Is it not lawful then to take a Bribe from
a Perfon otherwife worthy, to ferve his Coun-
try?*

A. No more than for a Judge to take a Bribe
for a Righteous Sentence ; nor is it any more
lawful to corrupt, than to commit Evil that Good
may come of it : Corruption converts a good Action
into Wickednefs.   Bribery of all Sorts is contrary
to the Law of God ; it is a heinous Sin, often pu-
nifhed with the fevereft Judgmenrs ; it involves in
it the Sin of Perjury as the Law ftands now, and
is befides the greateft Folly and Madnefs.

Q. *How is it contrary to the Law of God?*

A. The Law of God faith exprefsly, *Thou fhall
not wreft Judgment ; Thou fhalt not take a Gift :* If
it is a Sin in a Judge, it is much more in a Law-
giver

giver, or an Electors; becauſe the Miſchiefs oc-
caſioned by the firſt reach only to Individuals, that
of the laſt may affect whole Nations, and even the
Generations to come. The Pſalmiſt deſcribing the
Wicked, faith, *his right Hand is full of Bribes :* The
Prophet deſcribing the Righteous, tells us, *he ſhaketh
his Hands from holding a Bribe :* *Samuel* juſtifying his
Innocence, appeals to the People, *of whoſe Hands have
I taken a Bribe ?* Then as to divine Vengeance, holy
Job tells us, *that God ſhall deſtroy the Tabernacle of
Bribery.* *Achan*'s Avarice who had appropriated to
his own Uſe the golden Wedge and the *Babyloniſh*
Garment, brought the Judgments of God upon the
whole People, ſo that they fled before their Ene-
mies, till the Criminal was diſcovered and ſtoned to
Death. The Leproſy adhered to *Gehazi* (the Ser-
vant of *Eliſha*) and his Houſe for ever, for taking a
Bribe from *Naaman*, a rich Miniſter of a great
Prince : Therefore he that taketh a Bribe may juſtly
expect what is threatned in Holy Writ ; *He ſhall
not proſper in his Way, neither ſhall his Subſtance
continue ; his Silver and Gold ſhall not be able to
deliver him in the Day of the Wrath of the Lord.*

Q. *Why is he that taketh a Bribe guilty of the
Sin of Perjury ?*

A. Becauſe he ſweareth,

I A. B. *do ſwear* (or being one of the People
called Quakers, *I* A. B. *do ſolemnly affirm*) *I
have not receiv'd, nor had by my Self, or any Per-
ſon whatſoever in Truſt for me, or for my Uſe and
Benefit, directly or indirectly, any Sum or Sums of
Money, Office, Place, or Imployment, Gift, or Re-
ward, or any Promiſe or Security for any Money,
Office, Imployment, or Gift, in order to give my Vote
at this Election, and that I have not before been polled
at this Election.*

Q. What

Q. *What thinkeſt thou of thoſe who are bribed by Gluttony and Drunkenneſs.*

A. That they are viler than *Eſau* who ſold his Birth-right for a Meſs of Porridge.

Q. *Why is taking a Bribe Folly or Madneſs?*

A. Becauſe I muſt refund Ten-fold in Taxes of what I take in Election; and the Member who bought me, has a fair Pretence to ſell me, nor can I in ſuch a Caſe have any juſt Cauſe of Complaint.

Q. *What wilt thou ſay then to the Candidate that offers thee a Bribe?*

A. I will ſay, " Thy Money periſh with thee ; " as thou art now purchaſing thy Seat in Parlia- " ment, I have juſt Reaſon to ſuſpect that thou " reſolveſt to ſell thy Vote; what thou offereſt " and what thou promiſeth may be the Price of " the Liberty of my Country : I will not only " reject thy Bribe with Diſdain, but will vote " againſt thee.

Q. *Is not the Juſtice of a King, ſufficient Security for the Liberty of the People?*

A. The People ought to have more Security for all that is valuable in the World, than the Will of a mortal and fallible Man ; a King of *Britain* may make as many Peers, and ſuch, as he pleaſeth ; therefore the laſt and beſt Security for the Liberties of the People, is a Houſe of Commons Genuine and Independant.

Q. *What meaneſt thou by a Genuine Houſe of Commons?*

A. One that is the lawful Iſſue of the People, and no Baſtard.

Q. *How is a Baſtard Houſe of Commons pro-duc'd?*

A. When

A. When the People by Terror, Corruption, or other indirect Means, chufe fuch as they otherwife would not chufe; when fuch as are fairly chofen, are not returned; when fuch as are returned, are turn'd out by partial Votes in controverted Elections, and others not fairly chofen fet in their Places.

Q. *How may a Houfe of Commons become dependant ?*

A. When the Freedom of Voting is deftroy'd by Threatnings, Promifes, Punifhments, and Rewards by the open Force of the Government, or the Infults of the Populace; but above all by private Influence; for they who are armed with the Power of the Crown, have many ways of gratifying fuch as are fubfervient to their Defigns, and many ways of oppreffing fuch as oppofe them, both within the Bounds of the Law.

Q. *Can a King have a more faithful Council than a Houfe of Commons, which fpeaketh the Senfe of the People?*

A. None. For they will not only give him impartial Council, but will powerfully and chearfully affift him to execute what they advife.

Q. *What are the Marks of a Perfon worthy to ferve his Country in Parliament ?*

A. The Marks of a good Ruler given in Scripture, will ferve for a Parliament-man; *Such as rule over you fhall be Men of Truth, hating Covetoufnefs, they fhall not take a Gift, they fhall not be afraid of the Face of a Man,* Deut. xvi. therefore I conclude, That the Marks of a good Parliament-man are Riches with Frugality, Integrity, Courage, being well affected to the Conftitution, Knowledge of the State of the Country, being prudently frugal of the Money, careful of the Trade, and zealous over the Liberties of the People, having ftuck to the Interefts

of their Country in perilous Times, and being
affiduous in attendance.

Q. *Who is moft likely to take a Bribe ?*

A. He who offereth one.

Q. *Who is likely to be frugal of the People's
Money ?*

A. He who puts none of it in his own Pocket.

Q. *You feem by this to be averfe from chufing fuch
as accept of Places and Gratuities. from the Crown,
what is your Reafon for this Partiality ?*

A. I am far from thinking that a Man may not
ferve his King, and Country faithfully at the fame
time : nay their Interefts are infeparable. Mr. Such-
an one, my Lord's Steward is a very honeft Man,
and yet if I had any Affairs to fettle with my Lord,
I would chufe my Neighbour for a Referreè rather
than my Lord's Steward.

Q. *Why is Frugality of the People's Money fo ne-
ceffary at this time ?*

A. Becaufe they have run out much, and are
ftill much in Debt : My Father and I have paid our
fhare of One Hundred Millions, and I have heard
there are near Fifty more to pay : I grudge not this
prodigious Expence, as far as it hasbeen the neceffa-
ry Price of Liberty ; but as it would grieve me
much to fee this Bleffing ravifh'd from me which has
coft me fo dear ; fo on the other hand I think it
expedient to fave, now the Affair is over, and the
Government fettled.

Q. *Who are thofe who are careful of the Trade
of the Nation ?*

A. Such as are willing to keep it free from all
vexatious Interruptions by Infpections, Entering in-
to Houfes, Seizures, Suits, and the Oppreffion of
Tax-gatherers, as much as p: ffible; fuch as are
willing to take off the burdenfome Duties which
encreafe

encreafe the Expence of the Workman, and confe-
quently the Price of our Manufactures.

Q. *But as you have a Freehold, would you not be*
willing to be excus'd from paying two Shillings in the
Pound by laying Excifes upon other Parts of our
Confumptions?

A. No doubt but every Landed Man would be
glad to be free from paying Two Shillings in the
Pound ; but at the fame time I would not raife by
another Tax Two Shillings in the Pound, nor One
Shilling in the Pound for a Perpetuity. For Parlia-
ments who haye no more to give, may be difap-
pointed in the Redrefs of their Grievances. Befides,
I would not be deluded by an Impoffibility ; for if
my Tenant has any new Tax laid upon him, I am
afraid he will not pay me fo much Rent ; fo that the
new Tax muft ftill affect Land. Then it is utterly
impoffible to raife by Excifes what fhall be equiva-
lent to Two Shillings in the Pound without the Ruin
of Trade ; for the Excifes which are fettled already,
generally fpeaking, raife double the Duty upon the
People, of what they bring into the Government.

Q. *How can'ft thou prove that?*

A. By Experience of feveral Excifes, as of Lea-
ther, Candles, Soap, &c. Whatever is brought into
the Publick by thofe Excifes, is raifed double upon
the People ; therefore if a Million of Money, or
what is equivalent to Two Shillings in the Pound,
were levy'd by Excife, it would be Two Millions
upon the Excis'd Commodities, which muft de-
ftroy every Subject of Trade in *Britain.*

Q. *Why do'ft thou infift, That a Knowledge of*
the State of the Country is a neceffary Qualification
for a Parliament-man?

A. Becaufe this is a Qualification, of late, very
much

much unheeded : I have heard that there are many Corporations that never saw their Members.

Q. Is then a Writ of Parliament only a Conge d'Elire for a Bishop, where the King nominates ?

A. God forbid ; the Crown is never to meddle in an Election.

Q. Why is assiduous Attendance so necessary ?

A. Because a Parliament-man is entrusted with the Lives, Liberties and Properties of the People, which have often been endangered by the Non-attendance of many Members; because if Representatives do not attend, I may have a Law impos'd upon me, to which I had no opportunity of giving my Assent.

Q. Thou hast prudently and justly resolv'd to promote, to the utmost of thy Power, the Publick Tranquility ; what are the Advantages thou proposest from that ?

A. All the Advantages resulting from Political Society depend upon the Publick Tranquility : Besides, by Publick Tranquility, Armies, which are the Mark of Distrust of the Affections of the People, may be Disbanded.

Q. Why do'st thou not love Armies in Time of Peace ?

A. Because Armies have overturn'd the Liberties of most Countries ; and all who are well affected to Liberty, ever hated them ; because they are subject to an implicit Obedience to their Officers, and to a Law of their own ; because they are so many lusty Men taken from Work, and maintain'd at an extravagant Expence upon the Labour of the rest ; because they are many Ways burdensome to the People in their Quarters even under the best Discipline, especially in dear Countries ; because there are so many more Preferments in the Hands of Designing

figning Minifters; and laftly, becaufe the King
will never be deny'd an Army as great as he pleafeth,
when it is neceffary.

Q. *Thou rightly judgeft of thy Happinefs in being
a Member of a Political Society, govern'd by Laws,
to which the People give their Confent: Thou haft
been likewife well inftructed in the fundamental Laws
of the Government, and art well aware of the wicked
and abominable Practices that undermine, and are
likely to overturn the Conftitution: Be thou likewife
verily perfuaded that the equitable and fundamental
Laws of a Nation are, in a found Senfe, ftampt with
a Divine Authority; and that the good Order, Peace,
and Happinefs of the Society is firmly connected with a
ftrict Obfervance of them. That the Profperity of
Nations depend upon their Virtue, not only as an effect
upon its Natural Caufe, but by the immutable Ap-
pointment of Divine Juftice, by which Political
Societies muft receive their Rewards and Punifhments
in this World, fince they have no Being in the next;
confequently the Threatnings and Promifes which occur
in the Old Teftament are, in a proper Senfe, as ap-
plicable to other Nations as the* Ifraelites, *therefore
thou and all the People of this Land may fuppofe that
God Almighty fpeaketh to them as he fpoke by* Mofes
unto the Ifraelites, Deut. xxviii. 1. And it fhall
come to pafs, if thou fhalt hearken diligently unto
the Voice of the Lord thy God, to obferve and do
all his Commandments, (*that is the Laws of their
Conftitution*) which I command thee this Day; that
the Lord thy God will fet thee on high above all
Nations of the Earth, &c. *Verfe* 15. But it fhall
come to pafs, if thou wilt not hearken unto the
Voice of the Lord thy God, to obferve to do all his
Commandments and his Statutes which I command
thee this Day; that all thefe Curfes fhall come upon

thee and overtake thee. Curſed ſhalt thou be in the City, and Curſed ſhalt thou be in the Field. Curſed ſhall be thy Baſket and thy Store. Curſed ſhall be the Fruit of thy Body, and the Fruit of thy Land, the Increaſe of thy Kine, and the Flocks of thy Sheep. Curſed ſhalt thou be when thou comeſt in, and Curſed ſhalt thou be when thou goeſt out, &c. &c.

ΓΝΩΘΙ ΣΕ′ΑΥΤΟΝ. Know Yourſelf.

WHAT am I? how produc'd? and for
what end?
Whence drew I being? to what period tend?
Am I th'abandon'd orphan of blind chance;
Dropt by wild atoms in diſorder'd dance?
Or from an endleſs chain of cauſes wrought?
And of unthinking ſubſtance, born with thought?
By motion which began without a cauſe,
Supreamly wiſe, without deſign or laws.
Am I but what I ſeem, meer fleſh and blood;
A branching channel, with a mazy flood?
The purple ſtream that through my veſſels glides,
Dull and unconſcious flows like common tides:
The pipes through which the circling juices ſtray,
Are not that thinking I, no more than they:
This frame, compacted with tranſcendent ſkill,
Of moving joints obedient to my will;
Nurs'd from the fruitful glebe, like yonder tree,
Waxes and waſtes; I call it mine, not me:
New matter ſtill the mould'ring maſs ſuſtains,
The manſion chang'd, the tenant ſtill remains;

And

And from the fleeting stream repair'd by food,
Diftinct, as is the fwimmer from the flood.
What am I then? fure, of a nobler birth,
Thy parents right, I own a mother, earth;
But claim fuperior lineage by my SIRE,
Who warm'd th'unthinking clod with heavenly fire:
Effence divine, with lifelefs clay allay'd,
By double nature, double inftinct fway'd;
With look erect, I dart my longing eye,
Seem wing'd to part, and gain my native fky;
I ftrive to mount, but ftrive, alas! in vain,
Ty'd to this maffy globe with magick chain.
Now with fwift thought I range from pole to pole,
View worlds around their flaming centers roll:
What fteady powers their endlefs motions guide,
Thro' the fame tracklefs paths of boundlefs void!
I trace the blazing comet's fiery trail,
And weigh the whirling planets in a fcale:
Thofe godlike thoughts, while eager I purfue,
Some glitt'ring trifle offer'd to my view,
A gnat, an infect, of the meaneft kind,
Erafe the new-born image from my mind;
Some beaftly want, craving, importunate,
Vile as the grinning maftiffs at my gate,
Calls off from heav'nly truth this reas'ning me,
And tells me I'm a brute as much as he.
If on fublimer wings of love and praife,
My foul above the ftarry vault I raife,
Lur'd by fome vain conceit, or fhameful luft,
I flag, I drop, and flutter in the duft.
The tow'ring lark thus from her lofty ftrain,
Stoops to an emmet, or a barley grain.
By adverfe gufts of jarring inftincts toft,
I rove to one, now to the other coaft;
To blifs unknown my lofty foul afpires,
My lot unequal to my vaft defires.

i   As

As 'mongſt the hinds a child of royal birth
Finds his high pedigree by conſcious worth ;
So man, amongſt his fellow brutes expos'd,
Sees he's a king, but 'tis a king depos'd :
Pity him, beaſts ! you by no law confin'd,
Are barr'd from devious paths by being blind ;
Whilſt man, through op'ning views of various ways
Confounded, by the aid of knowledge ſtrays ;
Too weak to chooſe, yet chooſing ſtill in haſte,
One moment gives the pleaſure and diſtaſte ;
Bilk'd by paſt minutes, while the preſent cloy,
The flatt'ring future ſtill muſt give the joy.
Not happy, but amus'd upon the road,
And (like you) thoughtleſs of his laſt abode,
Whether next ſun his being ſhall reſtrain,
To endleſs nothing, happineſs, or pain.

Around me, lo, the thinking thoughtleſs crew,
(Bewilder'd each) their different paths purſue;
Of them I aſk the way ; the firſt replies,
Thou art a god ; and ſends me to the ſkies.
Down on this turf (the next) thou two-legg'd beaſt,
There fix thy lot, thy bliſs, and endleſs reſt :
Between thoſe wide extreams the length is ſuch,
I find I know too little or too much.

" Almighty pow'r, by whoſe moſt wiſe command,
" Helpleſs, forlorn, uncertain here I ſtand ;
" Take this faint glimmering of thy ſelf away,
" Or break into my ſoul with perfect day !
This ſaid, expanded lay the ſacred text,
The balm, the light, the guide of ſouls perplext :
Thus the benighted traveller that ſtrays
Through doubtful paths, enjoys the morning rays ;
The nightly miſt, and thick deſcending dew,
Parting, unfold the fields, and vaulted blue.
" O truth divine ! enlightened by thy ray,
" I grope and gueſs no more, but ſee my way ;
                                    " Thou

" Thou cleared'ft the fecret of my high defcent,
" And told me what thofe myftic tokens meant;
" Marks of my birth, which I had worn in vain,
" Too hard for worldly fages to explain;
" Zeno's were vain, vain Epicurus' fchemes,
" Their fyftems falfe, delufive were their dreams;
" Unfkill'd my twofold nature to divide,
" One nurs'd by pleafure, and one nurs'd by pride:
" Thofe jarring truths which human art beguile,
" Thy facred page thus bid me reconcile.
Offspring of God, no lefs thy pedigree,
.What thou once wer't, art now, and ftill may be, }
Thy God alone can tell, alone decree;
Faultlefs thou drept from his unerring fkill,
With the bare pow'r to fin, fince free of will:
Yet charge not with thy guilt, his bounteous love,
For who has power to walk, has power to rove;
Who acts by force impell'd, can nought deferve;
And wifdom fhort of infinite, may fwerve.
Born on thy new-imp'd wings, thou took'ft thy flight,
Left thy creator, and the realms of light;
Difdain'd his gentle precept to fulfil;
And thought to grow a god by doing ill:
Though by foul guilt thy heav'nly form defac'd,
In nature chang'd from happy manfions chac'd,
Thou ftill retain'ft fome fparks of heav'nly fire,
Too faint to mount, yet reftlefs to afpire;
Angel enough to feek thy blifs again,
And brute enough to make thy fearch in vain.
The creatures now withdraw their kindly ufe,
Some fly thee, fome torment, and fome feduce;
Repaft ill fuited to fuch diff'rent guefts,
For what thy fenfe defires, thy foul diftaftes;
Thy luft, thy curiofity, thy pride,
Curb'd, or deferr'd, or balk'd, or gratify'd,

Rage on, and make thee equally unbless'd,
In what thou want'ft, and what thou haft poffeft;
In vain thou hop'ft for blifs on this poor clod,
Return, and feek thy father, and thy God :
Yet think not to regain thy native fky,
Born on the wings of vain philofophy;
Myfterious paffage ! hid from human eyes;
Soaring you'll fink, and finking you will rife.:
Let humble thoughts thy wary footfteps guide,
Regain by meeknefs what you loft by pride.

HUYGENS *de Ratiociniis in Ludo Aleæ:*

Tranflated into *Englifh* by Dr. ARBUTHNOT.

The PREFACE.

IT is thought as neceffary to write a Preface before
a Book, as it is judged civil, when you invite a
*Friend to Dinner, to proffer him a Glafs of Hock be-
forehand for a Whet : And this being maim'd enough
for want of a Dedication, I am refolved it fhall not
want an Epiftle to the Reader too. I fhall not take
upon me to determine, whether it is lawful to play at
Dice or not, leaving that to be difputed betwixt the*
Fanatick Parfons *and the* Sharpers ; *I am fure it is
lawful to deal with Dice as with other Epidemic Di-
ftempers ; and I am confident that the writing a Book
about it, will contribute as little towards its Encour-
agement, as Fluxing and Precipitates do to Whoring.*

*It will be to little purpofe to tell my Reader, of how
great Antiquity the playing at Dice is, I will only let
him know, that by the* Aleæ Ludus, *the Antients
comprehended all Games, which were fubjected to the*
Determina-

Determination of mere Chance; this *fort of Gaming was ftrictly forbid by the Emperor* Juftinian, Cod. Lib. 3. Tit. 43. *under very fevere Penalties*; *and* Phocius Nomocan. Tit. 9. Cap. 27. *acquaints us, that the Ufe of this was altogether denied the Clergy of that time.* Seneca *fays very well,* Aleator quantò in arte eft melior, tantò eft nequior ; *That by how much the one is more fkilful in Games, by fo much he is the more culpable*; *or we may fay of this, as an ingenious Man fays of Dancing, that to be extraordinary good at it, is to be excellent in a Fault*; *therefore I hope no body will imagine I had fo mean a Defign in this, as to teach the Art of Playing at Dice.*

A great part of this Difcourfe is a Tranflation from Monf. Huygens's *Treatife,* De ratiociniis in ludo Aleæ ; *one, who in his Improvements of Philofophy, has but, one Superior, and I think few or no Equals. The whole I undertook for my own Divertifement, next to the Satisfaction of fome Friends, who would now and then be wrangling about the Proportions of Hazards in fome Cafes that are here decided. All it required was a few fpare Hours, and but little Work for the Brain*; *my Defign in publifhing it, was to make it of more general Ufe, and perhaps perfuade a raw Squire, by it, to keep his Money in his Pocket*; *and if, upon this account, I fhould incur the Clamours of the Sharpers, I do not much regard it, fince they are a fort of People the World is not bound to provide for.*

You will find here a verydplain and eafy Method of the Calculation of the Hazars of Game, which a Man may underftand, without knowing the Quadratures of Curves, *the Doctrine of* Series's, *or the Laws of* Concentripetation *of Bodies, or the Periods of the* Satellites *of* Jupiter ; *yea, without fo much as the Elements of* Euclid. *There is nothing required for the amprehending the whole, but common Senfe and practical*

tical Arithmetick; saving a few Touches of Algebra, *as in the first Three Propofitions, where the Reader, without fufpicion of Popery, may make ufe of a ftrong implicit Faith; tho' I muft confefs, it does not much recommend itfelf to me in thefe Purpofes; for I had rather he would enquire, and I believe he will find the Speculation not unpleafant.*

Every Man's Succefs in any Affair is proportional to his Conduct and Fortune. Fortune (in the fenfe of moft People) fignifies an Event which depends onChance, agreeing with my Wifh; and Misfortune fignifies fuch an one, whofe immediate Caufes I don't know, and confequently can neither foretel nor produce it (for it is no Herefy to believe, that Providence fuffers ordinary matters to run in the Channel of fecond Caufes). Now I fuppofe, that all a wife Man can do in fuch a Cafe is, to lay his Bufinefs on fuch Events, as have the moft powerful fecond Caufes, and this is true both in the great Events of the World, and in ordinary Games. It is impoffible for a Die, with fuch determined force and direction which makes it fall on fuch a determined fide, only I don't know the force and direction which makes it fall on fuch a determin'd fide, and therefore I call that Chance, which is nothing but want of Art; that only which is left to me, is to wager where there are the greateft number of Chances, and confequently the greateft probability to gain; and the whole Art of Gaming, where there is any thing of Hazard, will be reduced to this at laft, viz. in dubious Cafes to calculate on which fide there are moft Chances; and tho' this can't be done in the midft of Game precifely to an Unit, yet a Man who knows the Principles, may make fuch a Conjecture, as will be a fufficient direction to him; and tho' it is poffible if there are any Chances againft him at all, that he may lofe, yet when he chufeth the fafeft

fide,

fide, *he may part with his Money with more content (if there can be any at all) in such a Cafe.*

I will not debate, whether one may engage another in a difadvantageous *Wager.* Games may be fup-pos'd to be a tryal of *Wit* as well as *Fortune*, and e-very *Man*, when he enters the *Lifts* with another, un-lefs out of *Complaifance*, takes it for granted, his *For-tune* and *Judgment* are, at leaft, equal to thofe of his *Play-Fellows*; but this I am fure of, that falfe *Dice*, *Tricks* of Leger-de-main, &c. are inexcufable, for the queftion in Gaming is not, *Who is the beft Jugler?*

The Reader may here obferve the Force of *Numbers*, which can be fuccefsfully applied, even to thofe things, which one would imagine are fubject to no *Rules*. There are very few things which we know, which are not capable of being reduc'd to a *Mathematical Rea-foning*; and when they cannot, it's a fign the *Know-ledge* of them is very fmall and confus'd; and where a *Mathematical* reafoning can be had, it's as great fol-ly to make ufe of any other, as to grope for a thing in the *Dark*, when you have a *Candle* ftanding by you. I believe the *Calculation* of the *Quantity* of *Probabili-ty* might be improved to a very ufeful and pleafant *Speculation*, and applied to a great many *Events* which are accidental, befides thofe of *Games*; only thefe *Ca-fes* would be infinitely more confus'd, as depending on *Chances* which the moft part of *Men* are ignorant of; and as I have hinted already, all the *Politicks* in the *World*, are nothing elfe but a kind of *Analyfis* of the *Quantity* of *Probability* in cafual *Events*, and a good *Politician* fignifies no more, but one who is dextrous at fuch *Calculations*; only the *Principles* which are made ufe of in the *Solution* of fuch *Problems*, can't be ftudied in a *Clofet*, but acquired by the *Obfervation* of *Mankind*.

There is likewife a *Calculation* of the *Quantity* of *Probability* founded on *Experience*, to be made ufe of

in

in Wagers about any thing ; it is odds if a Woman is
with Child, *but it fhall be a* Boy; *and if you would
know the juft odds, you muft confider the Proportion
in the Bills that the Males bear to the Females : The
Yearly Bills of Mortality are obferved to bear fuch
Proportion to the live People as* 1 *to* 30, *or* 26; *there-
fore it is an even Wager, that one of thirteen, dies
within a Year (which may be a good Reafon, tho' not
the true, of that foolifh piece of Superftition,) becaufe,
at this rate, if* 1 *out of* 26 *dies, you are no lofer.   It
is but* 1 *to* 18 *if you meet a* Parfon *in the Street, that
he proves to be a* Non-Juror, *becaufe there is but* 1 *of*
36 *that are fuch.   It is hardly* 1 *to* 10, *that a* Wo-
man *of Twenty Years old has her* Maiden-head, *and
almoft the fame Wager, that a* Town-Spark *of that
Age has not been* clap'd.   *I think a Man might ven-
ture fome odds, that* 100 *of the* Gens d'arms *beats an
equal Number of* Dutch Troopers ; *and that an* En-
glifh Regiment *ftands its ground as long as another,
making Experience our Guide in all thefe Cafes and o-
thers of the like Nature.*

   *But there are no cafual Events, which are fo eafily
fubjected to Numbers, as thofe of Games ; and I be-
lieve, there the Speculation might be improved fo far,
as to bring in the Doctrine of the* Series's *and* Loga-
rithms.   *Since Gaming is become a Trade, I think it
fit the Adventurers fhould be upon the Square ; and
therefore in the Contrivance of Games there ought to be
a ftrict Calculation made ufe of, that they mayn't put
one Party in more probability to gain than another ;
and likewife, if a Man has a confiderable Venture ;
he ought to be allowed to withdraw his Money when
he pleafes, paying according to the Circumftances he is
then in : And it were eafy in moft Games to make
Tables, by infpection of which, a Man might know
what he was either to pay or receive, in any Circum-*
                                                    ftances

ſtances he is then in : And it were eaſy in moſt Games to make Tables, by Inſpection of which, a Man might know what he was either to pay or receive, in any Cir-cumſtances you can imagine, it being convenient to ſave a part of one's Money, rather than venture the loſs of it all.

I ſhall add no more, but that a Mathematician will eaſily perceive, it is not put in ſuch a Dreſs as to be taken notice of by him, there being abundance of Words ſpent to make the more ordinary ſort of People underſtand it.

FOR the ſake of thoſe who are not vers'd in *Mathematics,* I have added the following Ex-planation of *Signs.* $=$ *Equal.* $+$ *More,* or to be added. $-$ *Leſs,* or to be ſubtracted. $\times$ *Multipli-ed.* $\div$ *Divided.* *Example,* $3 \times 4 + 3 - 1 = 15 = \frac{5}{9}a$, is to be read thus ; 3 multiplied in 4, more by 3, leſs by 1, is equal to 14, which is equal to 5 ninth parts of *a.*

ALTHO' the Events of Games, which Fortune ſolely governs, are uncertain, yet it may be certainly determin'd, how much one is more ready to loſe than gain. For *Example :* If one ſhould wager, at the firſt throw with one Die, to throw ſix, it's an accident if he gains or not ; but by how much it's more probable he will loſe than gain, is really determin'd by the Nature of the Thing, and capable of a ſtrict Calculation. So like-wiſe if I ſhould play with another on this Condition, that the Victory ſhould be to the three firſt Games, and I had gain'd one already, it is ſtill uncertain who ſhall gain the third ; yet by a demonſtrative

C

Rea-

Reafoning, I can eftimate both the Value of his Expectation and mine, and confequently (if we agree to leave the Game imperfect) determine how great a fhare of the Stakes belong to me, and how much to my Play-fellow ; or if any were defirous to take my Place, at any rate I ought to fell it. Hence may arife innumerable Queries among two, three, or more Gamefters : And fince the Calculation of thefe things is a little out of the common Road, and can be oft-times apply'd to good Purpofe, I fhall briefly here fhew how it is to be done, and afterwards explain thofe things which belong properly to the Dice.

In both Cafes I fhall make ufe of this Principle, *One's Hazard or Expectation to gain any thing, is worth fo much, as, if he had it, he could purchafe the like Hazard or Expectation again in a juft and equal Game.*

For *Example*, if one, without my Knowledge, fhould hide in one hand 7 Shillings, and in his other 3 Shillings, and put it to my choice which Hand I would take, I fay this is as much worth to me, as if he fhould give me 5 Shillings ; becaufe, if I have 5 Shillings, I can purchafe as good a Chance again, and that in a fair and juft Game.

Prop. I. *If I expect* a *or* b, *either of which, with equal probability, may fall to me, then my Expectation is worth* $\underline{a + b}$, *that is, the half Sum of* a *and* b.

${}^{2}$

THAT I may not only demonftrate, but likewife inveftigate this Rule, fuppofe the Value of my Expectation be *x* ; by the former Principle having *x*, I can purchafe as good an Expectation again in a fair and juft Game. Suppofe then I play with another on thefe terms, That every one ftakes

 *x*,

x, and the Gainer give to the Lofer *a*, this Game is juft, and it appears, that at this rate, I have an equal hazard either to get *a* if I lofe the Game, or $2x-a$ if I gain; for in this cafe I get $2x$, which are the Stakes, out of which I muft pay the other *a*; but if $2x-a$ were worth *b*, then I have an equal hazard to get *a* or *b*; therefore making $2x-a=b$, $x=\frac{a+b}{2}$ which is the Value of my Expectation. The Demonftration is eafy; for having $\frac{a+b}{2}$, I can play with another who will ftake $\frac{a+b}{2}$ againft it, on this Condition, that the Gainer fhould give to the Lofer *a*; by this means I have an equal Expectation to get *a* if I lofe, or *b* if I win; for in the laft cafe I get $a+b$ the Stakes, out of which I muft pay *a* to my Play fellow.

In *Numbers*: if I had an equal hazard to get 3 or 7, then by this Propofition, my Expectation is worth 5, and it is certain, having 5, I may have the fame Chance; for if I play with another, fo that every one ftakes 5, and the Gainer pay to the Lofer 3, this is a fair way of gaming; and it is evident I have an equal hazard to get 3 if I lofe, or 7 if I gain.

Prop. II. *If I expect* a, b, *or* c, *either of which, with equal facility, may happen, then the Value of my Expectation is* $\frac{a+b+c}{3}$, *or the third part of the Sum of* a, b, *and* c.

FOR the Inveftigation of which, fuppofe *x* be the value of my Expectation; then *x* muft be fuch, as I can purchafe with it the fame Expectation in a juft Game: Suppofe the Conditions of the Game

be,

be, that playing with two others, each of us ftak
x, and I bargain with one of the Gamefters, if I wi
to give him *b*, and he fhall do the fame to me ; b
with the other, that if I gain, I fhall give him *c*, a₁
vice versâ ; this is fair play : And here I have an equ
hazard to get *b*, if the firft win, *c* if the fecond, ₁
$3x - b - c$ if I gain myfelf; for then I get $3x$, *viz.* tl
Stakes, of which I give the one *b* and the other *c*
but if $3x - b - c$ be equal to *a*, I have an equ
Expectation of *a*, *b*, or *c* ; therefore making $3x$ -
$b - c = a$, $x = \dfrac{a + b + c}{3}$, which is the Value
my Expectation. After the fame Method you w
find, if I had an equal hazard to get *a*, *b*, *c*, or ₁
the Value of my Expectation $\dfrac{a + b + c + d}{4}$, that
the fourth part of the Sum of *a*, *b*, *c*, and *d*, &c.

Prop. III. *If the number of Chances, by which a falls*
me, be p, *and the number of Chances, by which*
falls, be q, *and fuppofing all the Chances do happ*₁
*with equal facility, then the Value of my Expectati*₁
is $\dfrac{pa + bq}{p + q}$; i. e. *the Product of a multiplied in t*₁
number of its Chances added to the Product of |
*multiplied into the number of its Chances, and t*₁
Sum divided by the number of Chances both of
and b.

S Uppofe, as before, *x* be the Value of my E₁
pectation ; then if I have *x*, I muft be able t
purchafe with it that fame Expectation again in
fair Game : For this I fhall take as many Play-fe₁
lows as, with me, make up the number of $p + $₁
of which let every one ftake *x*, fo the whole Stak
will be $px + qx$, and every one plays with equ₁
hopes of winning ; with as many of my Fellow
Gamefte

Gamesters as the Number q stands for, I make the bargain one by one, that whoever of them gains shall give me b, and if I win, I shall do so to them ; with every one of the rest of the Gamesters, whose Number is $p - 1$, I make this bargain, that whoever of them gains, shall give me a, and I shall give every one of them as much, if I gain: It's evident this is fair play ; for no Man here is injur'd ; and in this case I have q Expectations to gain b, and $p - 1$ Expectations to gain a, and 1 Expectation (*viz.* when I win myself) to get $px + qx - bq - ap + a$; for then I am to deliver b to every one of the q Players, and a to every one of the $p - 1$ Gamesters, which makes $qb + pa - a$; if therefore $qx + bx - bq - ap + a$ were equal to a, I would have p Expectations of a (since just now I had $p - 1$ Expectations of it) and q Expectations of b, and so would have just come to my first Expectation ; therefore putting $px + qx - bq - ap + a = a$, and then is $x = \dfrac{ap + bq}{p + q}$.

In *Numbers :* If I had 3 Chances to gain for 13, and 2 for 8, by this Rule, my hazard is worth 11 ; for 13 multiplied by 3 gives 39, and 8 by 2, 16, these two added, make 55, divided by 5 is 11 ; and I can easily shew, if I have 11, I can come to the like Expectation again ; for playing with four others, and every one of us staking 11, with two of them I make this bargain, that whoever gains shall give me 8, and I shall too so to them ; with the other two I make this bargain, that whoever gains shall give me 13, and I them as much if I gain, and 3 Expectations to get 13, *viz.* if either I or any of the other two gain ; for in this case I gain the Stakes, which are 55, out of which I am oblig'd to give the first

two

two 8, and the other two 1 3, and fo there remains
13 for myfelf.

Prop. IV. *That I may come to the Queſtion propos'd,
viz. The making a juſt Diſtribution amongſt Game-
ſters, when their Hazards are unequal ; we muſt
begin with the moſt eaſy Caſes.*

SUppofe then I play with another, on condition
that he who wins the three firſt Games ſhall
have the Stakes, and that I have already gain'd two,
I would know if we agree to break off the Game,
and part the Stakes juſtly, how much falls to my
ſhare.

The firſt thing we muſt confider in fuch Queſtions
is the number of Games that are wanting to both :
For *Example*, if it had been agreed betwixt us, that
he ſhould have the Stakes who gain'd the firſt 20
Games, and if I had gain'd already 1 9, and my Fel-
low-Gameſter but 18, my hazard is as much better
than his in that cafe, as in this propofed, *viz.*
When of 3 Games I have 2, and he but one, be-
caufe in both cafes there's 2 wanting to him, and
1 to me.

· In the next place, to find the portion of the
Stakes due to each of us, we muſt confider what
would happen if the Game went on ; it is certain,
if I gain the firſt Game, I get the Stake, which I
call *a* ; but if he gain'd, both our Lots would be
equal, and fo there would fall to each of us $\frac{1}{2}a$;
but fince I have an equal hazard to gain or lofe the
firſt Game, I have an equal Expectation to gain *a*,
or $\frac{1}{2}a$, which, by the firſt *Propoſition*, is as much
worth as the half Sum of both; *i. e.* $\frac{3}{4}a$, fo there
is left to my Fellow-Gameſter $\frac{1}{4}a$; from whence it
follows, that he who would buy my Game ought to
pay me for it $\frac{3}{4}a$; and therefore, he who undertakes
to

to gain one Game before another gains two, may wager 3 to 1.

Prop. V. *Suppose I want but one Game, and my Fel-low-Gamester three, it is required to make a just Distribution of the Stake.*

LET us here likewise confider in what ftate we fhould be, if I or he ga'n'd the firft Game ; if I gain, I have the Stake a, if he, then he wants yet 2 Games, and I but 1, and therefore we fhould be in the fame Condition which is fuppofed in the former Propofition; and fo there would fall to my Share, as was demonftrated there, $\frac{3}{4}a$; therefore with equal facility there may happen to me a, or $\frac{3}{4}a$, which, by the firft Propofition, is worth $\frac{7}{8}a$, and to my Fellow-Gamefter there is left $\frac{1}{8}a$, and there-fore my hazard to his is as 7 to 1.

As the Calculation of the former Propofition was requifite for this, fo this will ferve for the following. If I fhould fuppofe myfelf to want but one Game, and my Fellow four, (by the fame Method) you will find $\frac{15}{16}$ of the Stake belongs to me, and $\frac{1}{16}$ to him.

Prop. VI. *Suppofe I want two Games, and my Fel-low Gamefter three.*

THEN by the next Game it will happen that I want but one, and he three, which (by the preceeding Propofition) is worth $\frac{7}{8}a$; or that we fhould both want two, whence there will be $\frac{1}{2}a$ due to each of us: Now I being in an equal probability to gain or lofe the next Game, I have an equal haz-ard to gain $\frac{7}{8}a$ or $\frac{1}{2}a$, which by the firft Propofition is worth $\frac{11}{16}a$; and fo there are eleven parts of the Stakes due to me, and five to my Fellow.

Prop.

Prop. VII. *Let us suppose I want two Games, and my Fellow four.*

IF I gain the next Game, then I shall want but one, and my Fellow four ; but if I lose it, then I shall want two, and he three : So I have an equal hazard for gaining $\frac{1}{4}a$, or $\frac{1}{16}a$, which, by the first is worth $\frac{5}{16}a$: So it appears, that he who is to gain two Games for the other's four, is in a better Condition than he who is to gain one for the other's two ; for my share in the first case is $\frac{3}{4}a$ or $\frac{12}{16}a$, which is less than $\frac{13}{16}$, my share in the last.

Prop. VIII. *Let us supppose three Gamesters, whereof the first an second want* 1 *Game, but the third* 2.

TO find the share of the first, we must consider what would happen if either he, or any of the other two gain'd the first Game ; if he gains, then ne has the Stake a ; if the second gain, he has nothing ; but if the third gain, then each of them would want a Game, and so $\frac{1}{2}a$ would be due to every one of them. Thus the first Gamester has one Expectation to gain a, one to gain nothing, and one for $\frac{1}{2}a$, (since all are in equal probability to gain the first Game) which by the second Proposition is worth $\frac{3}{4}a$: Now since the second Gamester's Condition is as good, his Share is likewise $\frac{3}{4}a$, and so there remains to the third $\frac{1}{2}a$, whose Share might have been as easily found by itself.

Prop. IX. *In any number of Gamesters you please, a-mongst whom there are some fewer Games : To find what is any one's share in the Stake, we must consider what would be due to him, whose Share we investigate, if either he, or any of his Fellow-Game-sters should gain the next following Game ; add all*
their

their Shares together, and divide the Sum by the
number of the Gamesters, the Quotient is his Share
you were seeking.

SUppofe three Gamefters *A*, *B*, and *C*; *A* wants
1 Game, *B* 2, and *C* likewife 2, I would find
what is the fhare of the Stake due to *B*, which I
fhall call *q*.

Firft, we muft confider what would fall to *B*'s
Share, if either he, *A*, or *C*, wins the next Game;
if *A* wins, the Game is ended, fo he gets nothing;
if *B* himfelf gain, then he wants 1 Game, *A* 1,
and *C* 2; therefore, by the former Propofition, there
is due to him in that Cafe $\frac{4}{9}q$, then if *C* gains the
next Play, then *A* and *C* would want but 1, and *B*
2; and therefore, by the eighth Propofition, his
Share would be worth $\frac{1}{9}q$; add together what is due
to *B* in all thefe three Cafes, *viz.* o $\frac{4}{9}q$, the Sum is
$\frac{5}{9}q$, which being divided by 3, the number of Game-
fters, gives $\frac{5}{27}q$, which is the Share of *B* fought for:
The Demonftration of this is clear from the fecond
Propofition, becaufe *B* has an equal hazard to gain
o $\frac{4}{9}q$ or $\frac{1}{9}q$, that is $\frac{o+\frac{4}{9}q+\frac{1}{9}q}{3}$, *i. e.* $\frac{5}{27}q$: Now it's e-
vident the Divifor 3 is the number of the Game-
fters.

To. find what is due to one in any Cafe; *viz.* if
either he, or any of his Fellow Gamefters win the
following Game; we muft confider firft the more
fimple Cafes, and by their help the following; for
as this Cafe could not be folved before the Cafe of
the eighth Propofition was calculated, in which, the
Games wanting were 1, 1, 2; fo the Cafe, where
the Games wanting are 1, 2, 3, cannot be calcula-
ted, without the Calculation of the Cafe, where the
Games wanting are 1, 2, 2, (which we have juft
now perform'd) and likewife of the Cafe, where the
Game

Games wanting are 1, 2, 2, (which we have ju now perform'd) and likewise of the Cafe, whei the Games wanting are 1, 1, 3, which can be dor by the eighth : And by this means you may recko all the Cafes comprehended in the following Table and an infinite number of others.

Games wanting	1,1,2	1,2,2	1, 1,3	1,2,3
Their Shares	4,4,1	17,5,5	13,13,1	19,6,2
	9	27	27	27

Games want.	1, 1,4	1, 1,5	1, 2,4	1, 2,
Shares	40,40,1	121,121,1	178,58,7	542,179
	81	243	243	729

Games wanting	1,3,3	1, 3, 4	1, 3, 5
Their Shares	65,8,8	616,82,31	629,87,13
	81	729	729

Games want.	2, 2, 3	2, 2, 4	2, 2, 5
Their Shares	34,34,13	338,338,53	353,353,23
	81	729	729

Games want.	2, 3, 3	2, 3, 4	2, 3, 5
Their Shares	33,55,55	451,195,83	433,635,119
	243	729	1187

As for the *Dice*; thefe Queftions may be propofed, at how many Throws one may wager to throw 6, any Number below that, with one Die ; How many Throws are required for 12 upon two Dice ; or 18 on 3 ; and feveral other Queftions to this purpofe.

For the refolving of which, it muft be confider'd, that in one Die there are fix different Throws, all equally probable to come up ; for I fuppofe the Die has the exact figure of a Cube : On two Dice there are 36 different throws ; for in refpect to every throw of one Die, any one throw of the 6 of the other Die may come up ; and 6 times 6 make 36. In three Dice there are 216 different throws ; for in relation to any of the 36 throws of two Dice, any one of the fix of the third may come up ; and 6 times 36 make 216 : So in four Dice there are 6 times 216 throws, that is, 1296 : And fo forward you may reckon the throws of any number of Dice, taking always, for the Addition of a new Die, 6 times the number of the preceding.

Befides, it muft be obferved, that in two Dice there is only one way 2 or 12 can come up ; two ways that 3 or 11 can come up ; for if I fhall call the Dice A and B, to make 3 there may be 1 in A, and 2 in B, or 2 in A, and 1 in B ; fo to make 11, there may be 5 in A, and 6 in B, or 6 in A, or 2 as well in A as B ; for 10 there are likewife three Chances ; for 5 or 9 there are four Chances ; for 6 or 8 five Chances ; for 7 there are fix Chances.

In 3 Dice there are found for	3 or 18	1
	4 or 17	3
	5 or 16	6
	6 or 15	10
	7 or 14	15
	8 or 13	21
	9 or 12	25
	10 or 11	27

Prop. X. *To find at how many times one may under-take to throw* 6 *with one Die.*

IF any fhould undertake to throw 6 the firft time, it's evident there's one Chance gives him the Stake, and five which give him nothing ; for there are 5 throws againft him, and only one for him. Let the Stake be called *a*, then he has one Expectation to gain *a*, and five to gain nothing, which, by the third Propofition, is worth $\frac{1}{6}a$, and there remains for the other $\frac{5}{6}a$; fo he who undertakes, with one Die, to throw 6 the firft time, ought to wager only 1 to 5.

2. Suppofe one undertake, at two Throws of 1 Die, to throw 6, his Hazard is calculated thus ; if he throw 6 at the firft, he has *a* the Stake ; if he do not, there remains to him one throw, which, by the former Cafe, is worth $\frac{1}{6}a$; but there is but one Chance which gives him 6 at the fift throw, and five Chances againft him ; fo there is one Chance which gives him *a*, and five which give $\frac{1}{6}a$, which by the fecond Propofition, is worth $\frac{11}{36}a$, fo there remains to his Fellow-Gamefter $\frac{25}{36}a$; fo the Value of my Expectation to his, is as 11 to 25, *i. e.* lefs than 1 to 2.

By the fame Method of Calculation, you will find, that his hazard who undertakes to throw 6 at
three

three times with one Die, is $\frac{91}{216}a$; fo that he can only lay 91 againſt 125, which is ſomething leſs than 3 to 4.

He who undertakes to do it at four times, his hazard is $\frac{671}{1296}a$, fo he may wager 671 againſt 625, that is, ſomething more than 1 to 1.

He who undertakes to do it at five times, his hazard is $\frac{4651}{7776}a$, fo he can wager 671 againſt 625, that is, ſomething leſs than 3 to 2.

His hazard who undertakes to do it at 6 times, is $\frac{11031}{46681}a$, and he can wager 4651 againſt 3125, that is, ſomething leſs than 2 to 1.

Thus any number of throws may be eaſily found; but the following Propoſition will ſhew you a more compendious way of Calculation.

Prop. XI. *To find at how many times one may undertake to throw* 12 *with two Dice.*

IF one ſhould undertake it at one throw, it's clear he has but one Chance to get the Stake a, and 35 to get nothing; which, by the third Propoſition, is worth $\frac{1}{36}a$.

He who undertakes to do it at twice, if he throw 12 the firſt time, gains a; if otherwiſe, then there remains to him one throw, which, by the former Caſe, is worth $\frac{1}{36}a$; but there is but one Chance which gives 12 at the firſt throw, and 35 Chances againſt him; fo he has 1 Chance for a, and 35 for $\frac{1}{36}a$, which by the third Propoſition is worth $\frac{71}{1296}a$, and there remains to his Fellow-Gameſter $\frac{1225}{1296}a$.

From theſe it's eaſy to find the Value of his hazard, who undertakes it at four times, paſſing by his caſe who undertakes it at three times.

If he who undertakes to do it at four times throws 12 the firſt or ſecond Caſt, then he has a; if not, there remains two other throws, which, by the former

former Cafe, are worth $\frac{65}{7776}a$; but for the fame reafon, in his two firft throws, he has 71 Chances which give him a, againft 1225 Chances, in which it may happen otherwife; therefore at firft he has 71 Chances which give him a, and 1225 which give him $\frac{1065}{7776}a$, which by the third Propofition is worth $\frac{178991}{1500625}a$, which fhews that their hazards to one another are as 178991 to 1500625.

From which Cafes it is eafy to find the Value of his Expectation, who undertakes to do it at 8 times, and from that, his Cafe who undertakes to do it at 16 times; and from his Cafe who undertakes to do it at 8 times, and his likewife who undertakes to do it at 16 times; it is eafy to determine his Expectation who undertakes to do it at 24 times: In which Operation, becaufe that which is principally fought, is the number of throws, which makes the hazard equal on both fides, *viz.* to him who undertakes, and he who offers, you may, without any fenfible Error, from the Numbers (which elfe would grow very great) cut off fome of the laft Figures. And fo I find, that he who undertakes to throw 12 with two Dice, at 24 times, has fome lofs; and he who undertakes it at 25 times, has fome advantage.

Prop. XII. *To find how many Dice one can undertake to throw two Sixes at the firft Caft.*

THIS is as much, as if one would know, at how many throws of one Die, he may undertake to throw twice fix: now if any fhould undertake it at two throws, by what we have fhewn before, his hazard would be $\frac{1}{36}a$; he who would undertake to do it at 3 times, if his firft throw were not 6, then there would remain two throws, each of which muft be 6, which (as we have faid) is *worth* $\frac{1}{36}a$; but if the firft throw be 6, he wants

one

only one 6 in the two following throws, which by
the tenth Propofition, is worth $\frac{1}{3}\frac{1}{6}a$: but fince he
has but one Chance to get 6 the firft throw, and
five to mifs it ; he has therefore, at firft, one Chance
for $\frac{1}{1}\frac{1}{6}a$, and five Chances for $\frac{1}{1}\frac{6}{6}a$, which, by the
third Propofition, ie worth $\frac{1}{2}\frac{6}{1}\frac{}{6} a$, or $\frac{2}{2}\frac{}{7}a$; after this
manner ftill affuming 1 Chance more, you will find
that you may undertake to throw two Sixes at 10
throws of one Die, or 1 throw of ten Dice, and that
with fome advantage.

Prop. XIII. *If I am to play with another one Throw,*
on this condition, that if 7 comes up I gain, if 10
he gains ; if it happens that we muft divide the
Stake, and not play, to find how much belongs to
me, and how much to him.

BEcaufe of the 36 different Throws of the two
Dice, there are fix which give 7 and 3 which
give 10, and 27 which equals the Game, in which
cafe there is due to each of us $\frac{1}{2}a$: But if none of
the 27 fhould happen, I have 6, by which I may
gain a, and 3, by which I may get nothing, which
by the third Propofition, is worth $\frac{2}{3}a$; fo I have 27
Chances for $\frac{1}{2}a$, and 9 for $\frac{2}{3}a$, which by the third
Propofition, is worth $\frac{11}{24}a$, and there remains to my
Fellow-Gamefter $\frac{11}{24}a$.

Prop. XIV. *If I were playing with another by turns,*
with two Dice, on this Condition, that if I throw
7 I gain, and if he throw 6 he gains allowing him
the firft Throw : To find the proportion of my Ha-
zard to his.

SUppofe I call the Value of my Hazard x, and
the Stakes a, then his Hazard will be $a - x$:
then wherever it's his turn to throw, my Hazard is x,
for

but when it's mine, the Value of my Hazard is greater. Suppofe I then call it *y*; now becaufe of the 36 throws of two Dice, there are five which give my Fellow-Gamefter 6, thirty-one which bring it again to my turn to throw, I have five Chances for nothing, and thirty-one for *y*, which, by the third Propofition, is worth $\frac{31}{36}y$; but I fuppos'd at firft my Hazard to be *x*; therefore $\frac{31}{36}=x$, and confequently $y=\frac{36}{31}x$. I fuppos'd likewife, when it was my turn to throw, the Value of my Hazard was *y*; but then I have fix Chances, which give me 7, and confequently the Stake, and thirty which give my Fellow the Dice, that is make my Hazard worth *x* : fo I have fix Chances for *a*, and thirty for *x*, which, by Prop. 3. is worth $\frac{6a+30x}{36}$, but this by fuppofition is equal to *y*, which is equal (by what has been prov'd already) to $\frac{36}{31}x$; therefore $\frac{30x+6a}{36}=\frac{36}{31}x$, and confequently $x=\frac{31}{41}a$, the Value of my Hazard, and that of my Fellow-Gamefter is $\frac{30}{41}a$, fo that mine is to his as 31 to 30.

Here follow fome Queftions which ferve to exercife the former Rules.

1. *A* and *B* play together with two Dice, *A* wins if he throws 6, and *B* if he throws 7 ; *A* at firft gets one throw, then *B* two, then *A* two, and fo on by turns, till one of them wins. I require the proportion of *A*'s Hazard to *B*'s ? *Anfwer*, It is 10355 to 12276.

2. Three Gamefters, *A*, *B*, and *C*, take i Counters, of which there are four white and e

bla

black'; the Law of the Game is this, that he ſhall win, who, hood-wink'd, ſhall firſt chuſe a white Counter; and that *A* ſhall have the firſt choice, *B* the ſecond, and *C* the third, and ſo, by turns, till one of them win. *Quær.* What is the proportion of their Hazards?

3. *A* wagers with *B*, that of 40 Cards, that is, 10 of every Suit, he will pick out four, ſo that there ſhall be one of every ſuit. *A*'s Hazard to *B*'s in this caſe is as 1000 to 8139.

4. Suppoſing, as before, 4 white Counters and 8 black, *A* wagers with *B*, that out of them he ſhall pick 7 Counters, of which there are 3 white. I require the proportion of *A*'s Hazard to *B*'s?

5. *A* and *B* taking 12 Counters, each play with three Dice after this manner, that if 11 comes up, *A* ſhall give one Counter to *B*; but if 14 comes up, *B* ſhall give one to *A*, and that he ſhall gain who firſt has all the Counters. *A*'s Hazard to *B*'s is 244140625 to 282429536481.

The *Calculus* of the preceding Problems is left out by Monſ. *Huygens,* on purpoſe that the ingenious Reader may have the ſatisfaction of applying the for-mer Method himſelf; it is in moſt of them more la-borious than difficult: For *Example,* I have pitch'd upon the ſecond and third, becauſe the reſt can be ſolv'd after the ſame Method.

PROBLEM I.

The firſt Problem is ſolv'd by the Method of Prop. 14. only with this difference, that after you have found the Share due to B, if A were to get no

firſt throw, you muſt ſubtract from it $\frac{1}{18}$ of the
Stake which is due to *A* for his Hazard of throwing
ſix at the firſt throw.

As for the ſecond Problem, it is ſolv'd thus; Sup-
poſe *A*'s Hazard, when it is his own turn to chuſe,
be *x*; when it is *B*'s; be *y*; and when it is *C*'s, be *z*;
it is evident, when out of 12 Counters, of which
there are 4 white and 8 black, he endeavours to
chuſe a white one, he has four Chances to get it, and
eight to miſs it ; that is, he has four Chances to get
the Stake *a*, and eight to make his hazard worth *y* :
ſo $x = \frac{4a + 8y}{12}$, and conſequently $y = \frac{12x - 4a}{8}$. When

it is *B*'s turn to chuſe, then he has four Chances for
nothing, and eight for *z*, (that is, to bring it to *C*'s
turn) conſequently $y = \frac{8z}{12} = \frac{12x - 4a}{8}$; this Equation

reduc'd gives $z = \frac{9x - 3a}{4}$; when it comes to *C*'s

turn to chuſe, then *A* has four Chances for nothing,
and eight for *x*, conſequently $z = \frac{8x}{12} = \frac{2}{3}x$, therefore
$\frac{2}{3}x = \frac{9x - 3a}{4}$; this equation reduc'd gives $x = \frac{9}{13}a$, and

conſequently there remains to *B* and *C* $\frac{10}{13}a$, which
muſt be ſhar'd after the ſame manner, that is, ſo
that *B* have the firſt Choice, *C* the next, and ſo on,
till one of them gain ; the Reaſon is, becauſe it had
been juſt in *A* to have demanded $\frac{9}{13}$ of the Stake
for not playing, and then the Seniority fell to *B* ;
now $\frac{10}{13}a$, parted betwixt *B* and *C*, by the former
Method, gives $\frac{6}{13}$ to *B*, and $\frac{4}{13}$ to *C*; ſo *A*, *B*,
and *C*'s Hazards from the beginning were as 9, 6,
4.

I have fuppos'd here the Senfe of the Problem to be, that when any one chus'd a Counter, he did not diminifh their number; but if he mifs'd of a white one, put it in again, and left an equal hazaad to him who had the following choice; for if it be otherwife fuppos'd, A's fhare will be $\frac{25}{217}$, which is lefs than $\frac{9}{19}$.

Prob. 2. It is evident, that wagering to pick out 4 Cards out of 40, fo that there be one of every Suit, is no more than wagering, out of 39 Cards to take three propofed Suits; for it is all one which Card you draw firft, all the hazard being whether out of the 39 remaining you take 3, of which none fhall be of the Suit you firft drew : Suppofe then you had gone right for three times, and were to draw your laft Card, it is clear that there are 27 Cards, (*viz.* of the Suits you have drawn before) of which, if you draw any you lofe, and 10, of which if you draw any, you have the Stake a; fo you have 10 Chances for a, and 27 for nothing, which by Prop. 3. is worth $\frac{10}{37}a$. Suppofe again you had gone right only for two Draughts, then you have 18 Cards (of the Suits you have drawn before) which make you lofe, and 20, which put you in the Cafe fuppofed formerly, *viz.* where you have but one Card to draw, which, as we have already calculated, is worth $\frac{10}{37}a$; fo you have 18 Chances for nothing, and 20 for $\frac{10}{37}a$, which, by Prop. 3. is worth $\frac{100}{703}a$. Suppofe again you have 3 Cards to draw, then you have 9 (of the Suit you drew firft) which make you lofe, and 30 which put you in the cafe fuppos'd laft ; fo you have 9 Chances for nothing, and 30 for $\frac{100}{703}a$, which by Propof. 3. is worth $\frac{3000}{27417}a$, or $\frac{1000}{9139}a$, and you leave to your Fellow-Gamefter $\frac{8139}{9139}a$; fo your Hazard is to his as 1000 to 8139.

It is eafy to apply this Method to the Games that are in ufe amongft us : for *Example*, If *A* and *B*, playing at *Back-gammon*, *A* had already gain'd one end of three, and *B* none, and if *A* had the Dice in his Hand for the laft throw of the fecond end all, his Men but two upon the Ace Point being already caft off : *Quær.* What is the proportion of *A*'s Hazard to *B*'s ?

Solution : There being of the 36 Throws of two Dice, fix which give Doublets; if *A* throw any of the fix, he has the ftake *a* ; if he throw any of the other thirty, then he wants but one Game, and his Fellow-Gamefter three, which by Prop. V. is $\frac{7}{8}a$; fo *A* has fix Chances for *a*, and thirty for $\frac{7}{8}a$, which, by Prop. III. is worth $\frac{129}{144}a$, and there remains to his Play-Fellow $\frac{15}{144}a$; fo *A*'s Hazard to *B*'s is as 129 to 15, that is, lefs than 9 to 1.

Suppofing the fame Cafe, and if their Bargain had been, that he gain'd three ends before the other gain'd one, fhould have double of what each ftak'd, that is, the Stake and a half more, then there had been due to *A* $\frac{252}{264}$ of the Stake, that is, *B* ought only to take $\frac{12}{264}$, and leave the reft to *A*.

Thus likewife, if you apply the former Rule to the *Royal-Oak Lottery*, you will find, that he who wagers that any Figure fhall come up at the firft throw, ought to wager 1 againft 31 ; that he who wagers it fhall come up at one of the two throws, ought to wager 63 againft 961 ; that he who wagers that a Figure fhall come up at once in three times, ought to lay 125055 againft 923521, *&c.* it being only fomewhat tedious to calculate the reft. Where you will find, that the equality will not find, that the equality will not fall as fome imagine on 16 Throws, no more than the equality of wagering at *how many* Throws of one Die 6 fhall come up, falls

falls on three; the contrary of which you have feen already demonftrated: You will find by calculation, that he has the Difadvantage, who wagers, that 1 of the 32 different Throws of the *Royal-Oak Lot-tery* fhall come at once of 20 times, and that he has fome advantage, who wagers on 22 times, fo the neareft to Equality is on 21 times. But it muft be remembred, that I have fuppos'd in the former Calculation, the Ball in the *Royal-Oak Lottery*, to be regular, tho' it can never be exactly fo; for he, who has the fmalleft Skill in Geometry, knows that there can be no regular Body of 32 fides; and yet this can be of no Advantage to him who keeps it.

To find the Value of the Throws of Dice, as to the Quantity.

NOthing is more eafy, than by the former Method to determine the Value of any number of Throws of any number of Dice; for in one throw of a Die, I have an equal Chance for 1, 2, 3, 4, 5, 6, confequently my Hazard is worth their Sum 21 divided by their Number 6, that is, $3\frac{1}{2}$. Now if one throw of a Die be worth $3\frac{1}{2}$, then two throws of a Die, or one throw of two Dice is worth 7, two throws of two Dice, or one throw of four Dice is worth 14, &*c.* The general Rule being to multiply the Number of Dice, the Number of Throws, and $3\frac{1}{2}$ continually.

This is not to be underftood as if it were an equal Wager to throw 7, or above it, with two Dice at one throw; for he who undertakes to do fo, has the Advantage by 21 againft 15. The meaning is only, if I were to have a Guinea, a Shilling, or anything elfe, for every Point that I threw with two Dice at one throw, my Hazard is worth 7 of thefe, becaufe he who gave me 7 for it, would have an equal pro- bability

bability of gaining or lofing by it, the Chances of the Throws above 7, being as many as of thefe below it : So it is more than an equal Wager to throw 12 at leaft at two Throws of two Dice, becaufe it is more probable that 14 will come, than any one. Number befides, and as probable that it will be above it as below it ; but if one were to buy this Hazard at the rate abovemention'd, he ought juft to give 14 for it. The equal wager in oneThrow of two Dice, is to throw 7 at leaft one time, and 8 at leaft another time, and fo *per vices :* The Reafon is, becaufe in the firft Cafe I have 21 Chances againft 15, and in the fecond 15 Chances againft 21.

Of RAFFLING.

IN *Raffling*, the different Throws and their Chances are thefe ; Where ir is to be obferved, that of the 216 different Throws of three Dice, there are only 96 that give Doublets, or two, at leaft, of a kind; fo it is 4 to 5 that with three Dice you fhall throw Doublets, and it is 1 to 35 that you throw a Raffle, or all three of a Kind. It is evident likewife, that it is an even Wager to throw 11 or above it, becaufe there are as many Chances for 11, and the Throws a-

Throws.	Chan.	
3	18	1
4	17	3
5	16	6
6	15	4
7	14	9
8	13	9
9	12	7
10	11	9

bove it, as for the Throws below it ; but tho' it be an even Wager to throw 11 at one Throw, it is a Difadvantage to wager to throw 22 at two Throws, and far more to wager to throw 33 at three Throws ; and yet it is more than an equal Wager that you fhall throw 21 at two Throws in Raffling, becaufe it is as probable that you will, as that you will not throw 11, at leaft, the firft time, and more than probable that you will throw 10, at leaft the fecond Time.

For an inftance of the plainnefs of the preceding Method, I will fhew, how by fimple Subftraction, the moft part of the former Problems my be folv'd.

Suppofe *A* and *B*, playing together, each, of them ftakes 32 Shillings, and that *A* wants one Game of the number agreed on, and *B* wants two.; to find the fhare of the Stakes due to each of them. It's plain, if *A* wins the next Game, he has the whole 64 Shillings; if *B* wins it, then their Shares are equal; therefore fays *A* to *B*, If you will break off the Game, give me 32, which I am fure of, whether I win or lofe the next Game; and fince you will not venture for the other 32, let us part them equally, that is, give me 16, which with the former 32 make 48, leaving 16 to you.

Suppofe *A* wanted one Game, and *B* three; if *A* wins the next Game, he has the 64 Shillings; if *B* wins it, then they are in the condition formerly fuppos'd, in which cafe there is 48 due to *A*; therefore fays *A* to *B*, give me the 48 which I am fure of, whether I win or lofe the next Game; and fince you will not hazard for the other 16, let us part them equally, that is, give me 8, which, with the former 48, make 56, leaving 8 to you; and fo all the other Cafes may be folv'd after the fame manner.

Suppofe *A* wagers with *B*, that with one Die he fhall throw 6 at one of three Throws, and that each of them ftakes 108, Guineas; to find what is the proportion of their Hazards. Now there being in one Throw of a Die but one Chance for 6, and five Chances againft it, one Throw for 6 is worth $\frac{1}{6}$ of the Stake; therefore fays *B* to *A*, of the 216 Guineas take a fixth part for your firft Throw, that is, 36; for your next Throw take a fixth part of the remaining 180, that is, 30; and for your third Throw, take a fixth part of the remaining 150, that is, 25, which

D 4

which in all make 91, leaving to me 125 ; so his hazard who undertakes to throw 6 at one of the three Trows, is 91 to 125.

Suppose *A* had undertaken to throw 6 with one Die at one Throw of four, and that the whole Stake is 1296 ; says *A* to *B*, every Throw for 6 of one Die, is worth the sixth part of what I throw for ; therefore for my first Throw give me 216, which is the sixth part of 1296, and there remains 1080, I must have the sixth part of that, *viz.* 180, for my second Throw ; and the sixth part of the remaining 900, which is 150, for my third Throw ; and the sixth part of the last remainder 750, which is 125 for my fourth ; all this added together makes 671, and there remains to you 625 ; so it is evident, that *A*'s Hazard, in this Case, is to *B*'s 671 to 525.

Suppose *A* is to win the Stakes (which we shall suppose to be 36 (if he throws 7 at once of twice with two Dice, and *B* is to have them if he does not ; says *B* to *A*, the Chances which give 7 are 6 of the 36, which is as much as 1 of 6 ; therefore for your first Throw you shall have a sixth part of the 36, which is 6 ; and for your next Throw a sixth part of the remainder 30, which is 5 ; this in all makes 11 ; so you leave 25 to me ; so *A*'s Hazard is to *B*'s as 11 to 25.

It were easy, at this rate, to calculate the most intricate Hazards, were it not that Fractions will occur ; which, if they be more than $\frac{1}{2}$, may be suppos'd equal to an Unit, without causing any remarkable Error in great Numbers.

It will not be amiss, before I conclude, to give you a Rule for finding in any number of Games the Value of the first, because *Huygens*'s Method, in that Case, is something tedious.

Suppo

Suppofe *A* and *B* had agreed, that he fhould have the Stakes who did win the firft 9 Games, and *A* had already won one of the 9; I would know what fhare of *B*'s Money is due to *A* for the Advantage of this Game. To find this, take the firft eight even Numbers 2, 4. 6, 8, 10, 12 14, 16, and multiply them continually, that is, the firft by the fecond, the product by the third, *&c.* take the firft eight odd Numbers 1, 3, 5, 7, 9, 11, 13, 15, and do juft fo by them, the product of the even Number is the Denominator, and the product of the odd Number the Numerator of a Fraction, which expreffeth the quantity of *B*'s Money due to *A* upon the winning of the firft Game, of 9; that is, if each ftak'd a number of Guineas, or Shillings, *&c.* exprefs'd by the Product of the even Numbers, there would belong to *A*, of *B*'s Money, the Number exprefs'd by the product of the odd Numbers. For *Example*, Suppofe *A* had gain'd one Game of 4. then by this Rule, I take the three firft even Numbers, 2, 4, 6, and multiply them continually, which make 48, and the firft three odd Numbers, 1, 3, 5, and multiply them continually, which make 15; fo there belongs to *A* $\frac{15}{48}$ of *B*'s Money, that is, if each ftak'd 48, there would belong to *A*, befides his own, 15 of *B*'s. Now by *Huygens*'s Method, if *A* wants but three Games while *B* wants four, there is due to *A* $\frac{11}{16}$ of the Stake; by this Rule there is due to *A* $\frac{11}{16}$ of *B*'s Money; which is $\frac{11}{32}$ of the Stake, which, with his own $\frac{16}{32}$ of the Stake, makes $\frac{27}{32}$ or $\frac{11}{16}$ of the Stake; and fo in every Cafe you will find *Huygens*'s Method, and this will give you the fame Number. A Demonftration of it you may fee in a Letter of Monfieur *Pafcal*'s to Monfieur *Fermat*; though it be otherwife exprefs'd there than here, yet the confequence is eafily fupply'd. To

prevent

prevent the labour of Calculation, I have fubjoin'd the following Table, which is calculated for two Gamfters, as Monfieur *Huygens's* is for three.

If each of us ftake 256 *Guineas* in

		6	5	4	3	2	1
	1ſt Game	63	70	80	96	128	256
2	1ſt Games	126	140	160	192	256	
3	1ſt Games	182	200	224	256		
4	1ſt Games	224	240	256			
5	1ſt Games	248	256				
6	1ſt Games	256					

(left margin, vertical:) There belongs to me 256 of my Play-fellow

The Uſe of the Table is plain; for let our Stakes be what they will, I can find the Portion due to me upon the winning the firft, or the firſt two Games, &c. of 2, 3, 4, 5, 6. For *Example*, If each of us had ſtak'd 4 Guineas, and the number of Games to be play'd were 3, of which I had gain'd 1, I ſay, As 256 is to 96, fo is 4 to a fourth, ꝛ ..... the ſum ... find a Letter ... ... may ... ... if he ... ... 3 ... there than ... ꝛ the ... ... is eaſily 1½ ...

ꝛ verq preſent

256 : 96 : : 4 : $1\frac{1}{2}$

To find what is the Value of his Hazard, who under-
takes, at the first Throw, to cast Doublets, in any
given number of Dice.

In two Dice it is plain, to avoid Doublets, every
one of the six different Throws of the first, can on-
ly be combin'd with five of the second, because one
of the six is of the same kind, and consequently
makes Doublets ; for the same Reason, the thirty
Throws of two Dice, which are not Doublets, can
only be combin'd with four Throws of a Dice so
generally it is this Series,

$$\frac{6 \times 5 \times 4 \times 3 \times 2 \times 1 \times 0, \&c.}{6 \times 6 \times 6 \times 6 \times 6 \times 6 \times 6, \&c.}$$

The second Series is the Sum of the Chances,
and the first the Number of Chances against him
who undertakes to throw Doublets, each Series can
be continu'd so many terms, as are the Number of
Dice. For *Example*, If one should undertake to
throw Doublets at the first Throw of four Dice,
his Adversary's Hazard is $\frac{6 \times 5 \times 4 \times 3}{6 \times 6 \times 6 \times 6} = \frac{360}{1296}$ or $\frac{5}{18}$
leaving to him $\frac{11}{18}$, so he has 13 to 5. *In seven*
Dice, you see the Chances against him are 0, be-
cause then there must necessarily be Doublets.

Of Whist.

If there be four playing at Whist, it is 15 to 1 that
any two of them shall not have the four Honours,
which I demonstrate thus.

Suppose the four Gamester's be *A, B, C, D* : If
A and *B* had, while the Cards are a dealing al-
ready

ready got three Honours, and wanted only one, since
it is as probable that G and D will have the next
Honour, as A and B; if A and B had laid a Wager
to have it, there is due to them but $\frac{1}{4}$ of the Stake : If
A and B wanted two of the four, and had wager'd
to have both those two, then they have an equal ha-
zard to get nothing, if they mifs the firft of thefe
two, or to put themfelves in the former Cafe if they
get ; fo they have an equal Hazard to get nothing,
or $\frac{1}{4}$, which by *Prop.* 1. is worth $\frac{1}{8}$ of the Stake ;
fo if they want three Honours, you will find due to
them $\frac{1}{16}$ of the Stake ; and if they wanted four, $\frac{1}{16}$
of the Stake leaving C and D $\frac{15}{16}$; fo C and D can
wager 15 to 1, that A and B fhall not have all the
four Honours.

It is 11 *to* 5 *that* A *and* B *fhall not have three of the
four Honours, which I prove thus :*

1. It is an even Wager, if there were but three Ho-
nours, that A and B fhall have two of thefe three,
fince 'tis as probable that they will have two of the
three, as that C and D fhall have them ; confe-
quently, if A and B had laid a Wager to have two
of three, there is due to them $\frac{1}{2}$ of the Stake. Now
fuppofe A and B had wager'd to have three of four,
they have an equal hazard to get the firft of the
four, or mifs it ; if they get it, then they want
two of the three, and confequently there is due to
them $\frac{1}{2}$ of the Stake ; if they mifs it, then they
want three of the three, and confequently there is
due to them $\frac{1}{8}$ of the Stake ; therefore, by *Prop.*
1. their Hazard is worth $\frac{5}{16}$, leaving to C and D
$\frac{11}{16}$.

A *and* B *playing at* Whiſt *agạinſt* C *and* D ; A *and*
B *have eight of ten, and* C *and* D *nine, and there-*
fare can't reckon Honours ; to find the proportion of
their Hazards.

There is $\frac{3}{16}$ due to *A* and *B* upon their hazard of
having three of four Honours, but ſince *C* and *D*
want but one Game, and *A* and *B* two, there is
due to *A* and *B* but $\frac{1}{2}$, or $\frac{8}{16}$ more upon that Ac-
count, by *Prop.* 4, this in all makes $\frac{11}{16}$, leaving to
C, and *D* $\frac{5}{16}$; ſo the hazard of *A* and *B* to that of
C and *D,* is as 9 to 7.

In the the former Calculations I have abſtraĉted
from the ſmall difference of having the Deal and
being Seniors.

All the formerCaſes can be calculated by the *Theo-*
rems laid down by Monſieur *Huygens* ; but Caſes
more compos'd require other Principles : For the
eaſy and ready Computation of which, I ſhall add
one *Theorem* more, demonſtrated after Monſieur
Huygens's Method.

THEOREM.

If I have *p* Chances for *a,* *q* Chances for *b,* and *r*
Chances for *c,* then my hazard is worth $\frac{ab+bq+cc}{p+q+r}$;
that is, *a* multiplied into the number of its Chances,
added to *b,* multiplied into the number of its Chan-
ces, added to *c,* multiplied into the number of its
Chances, and the Sum divided by the Sum of
of Chances of *a, b, c.*

To inveſtigate as well as demonſtrate this *Theorem,*
ſuppoſe the value of my hazard be *x,* then *x* muſt be
ſuch, as having it, I am able to purchaſe as good a
Hazard again in a juſt and equal Game. Suppoſe the
Law of it be this, That playing with ſo many
Gameſters as, with myſelf, make up the number
p + q + r, with as many of them as the number *p* re-
preſents,

prefents, I make this bargain, that whoever of the
win shall give me a, and that I shall do fo to the
if I win; with the Gamesters reprefented by the
number of q, I bargain to get b, if any of them
win, and to give b to each of them, if I win my
felf; and with the reft of the Gamefters, who
number is $r-1$, I bargain to give, or to get c af
the fame manner: Now all being in an equal pi
bability to gain, I have p Chances to get a,
Chances to get b; and $r-1$ Chances to get c, a
one Chance, *viz.* when I win myfelf, to get $px+$
$+rx-ap-bq-rc+c$, which if it be fuppos'd equ
to c, then I have p Chances for a, q Chances for
and r Chances for c (for I had juft now $r-1$ Chanc
for it) and therefore, in Cafe $px+qx+rx-ap-$
$-rc+c=c$, then is $x=\dfrac{ap+bq+cr}{p+q+r}$.

By the fame Way of reafoning you will find, if
have p Chances for a, q Chances for b, r Chanc
for c, and s Chances for d, and that my Hazard

$$\frac{ap+bq+cr+ds}{p+q+r+s}, \&c.$$

In NUMBERS.

If I had two Chances for 3 Shillings, fo
Chances for 5 Shillings, and one Chance for
Shillings, then, by this Rule, my Hazard is wor
5 Shillings; for $\dfrac{2\times3+4\times5+1\times9}{7}=5$; and it
eafy to prove, that with 5 Shillings I can purcha
a like Hazard again; for fuppofe I play with fix
thers, each of us ftaking 5 Shillings; with two
them I bargain, that if either of them win, he mu
give me 3 Shillings, and that I fhall do fo to them
and with the other four I bargain juft fo, to give
to get 5 Shillings: This is a juft Game, and all

ing in an equal probability to win; by this means I have two Chances to get 3 Shillings, four Chances to get 3 Shillings, and one Chance to get 9 Shillings, *viz.* when I win myself; for then out of the Stake, which makes 35 Shillings, I must give the first two 6 Shillings, and the other four 20 Shillings, so there remains just 9 to myself.

It is easy, by the Help of this *Theorem*, to calculate in the *Game of Dice*, commonly call'd *Hazard*, what Mains are best to set on, and who has the Advantage, the Caster or Setter. The *Scheme* of the Game, as I take it, is thus:

Mains.	Throws next following for	
	The *Caster*.	The *Setter*.
V.	V.	II. III. XI. XII.
VI.	VI. XII.	XI. II. III.
VII.	VII. XI.	XII. II. III.
VIII.	VIII. XII.	XI. II. III.
IX.	IX.	II. III. XI. XII.

By an easy Calculation you will find, if the Caster has IV, and the Setter VII, there is due to the Caster ½ of the Stake; if he has

V against VII, ⅔ of the Stake.

VI against VII, ¹⁄₅ of the Stake.

IV against VI, ⅗ of the Stake.

V against VI, ⅘ of the Stake.

IV against V, ¾ of the Stake.

I need not tell the Reader, that IV is the same with X, V with IX, and VI with VIII.

Suppose then VII be the Main: To find the Proportion of the Hazard of the Caster to that of the Setter.

I

By the Law of the Game, the Cafter, b
throws next, has four Chances for nothi
thefe II, III, XII; eight Chances for th
'Stake, *viz.* thofe of VII, XI; fix Chance
viz. thofe of IV, X; eight Chances for
thofe of V, IX; and ten Chances for ₁⁵
thofe of VI, VIII; fo his Hazard, by the p
Theorem, is

$$\frac{4\times 0 + 8\times 1 + 6\times \frac{1}{3} + 8\times \frac{2}{3} + 10\times}{36}$$

Now to fave the Trouble of a tedious Re
fuppofe the Stake which they play for be
is the Setter had laid down 18; in that Ca
ry one of thefe Fractions are fo many Par
Unit, which being gather'd into one Sur
$17\frac{11}{17}$ to the Cafter, leaving $18\frac{11}{17}$ to the
fo the Hazard of the Cafter is to that of th
244,251.

Suppofe VI, or VIII, be the Main, 1
Share of the Cafter is

II.
III. VI. IV. V.
XI. XII. X. IX. VIII. VII.

$$5\times 0 + 6\times 1 + \times 6\frac{1}{2} + 8\times\frac{2}{3} + 5\times\frac{2}{3} + 6\times\frac{6}{11} =$$

leaving to the Setter $18\frac{167}{356}$; fo the H
the Cafter is to that of the Setter as 6
7295.

Suppofe V, or IX, be the Main, then t
of the Cafter is

II.
III.
XI. IV. VI.
XII. V. X. IX. VIII. VII.

$$6 \times 0 + 4 \times 1 + 6 \times \tfrac{2}{7} + 4 \times \tfrac{1}{2} + 10 \times \tfrac{4}{5} + 6 \times \tfrac{5}{6} = 17\tfrac{11}{35}\tfrac{8}{8},$$

leaving to the Setter $\frac{26}{115}$; fo the Hazard of the Ca-
fter is to that of the Setter as 1396 to 1439.

It is plain, that in every Cafe the Cafter has the
Difadvantage, and that V, or IX, are better Mains
to fet on that VII, becaufe, in this laft Caft, the
Setter has but 18 and $\frac{14}{35}$, or $\frac{26}{115}$; whereas, when
V or IX is the Main, he has $18\frac{261}{715}$; likewife VI,
or VIII, are better Mains than V, or IX, be-
caufe $\frac{267}{715}$ is a greater Fraction than $\frac{26}{715}$.

All thofe Problems fuppofe Chances, which are in
an equal Probability to happen; if it fhould be fup-
pofed otherwife, there will arife Variety of Cafes of
a quite different Nature, which, perhaps, it were
not unpleafant to confider: I fhall add one *Problem*
of that Kind, leaving the Solution to thofe who
think it merits their Pains.

In Parallelipipedo cujus latera funt ad invicem in
ratione a, b, c: *Invenire quotâ vice quivis fufci-*
pere poteft, ut datum quodvis planum, v. g. a b
jaciat.

E

THE
LONGITUDE
EXAMIN'D.

A Short Epiftle to the *Longitudinarians.*

Gentlemen,

THE Books that are written about the *Longi-tude,* are *fo acceptable to the Publick, that the whole Edition is commonly fold off*, before any of'them can reach our Northern Bookfellers ; therefore I hope *you will not refufe to admit me into your Number, tho' my Attempt is publifh'd fo late*; neither will you look *upon me as your Enemy, if I overthrow all your Schemes, to fet up mine*; for, if you'll believe me, I am in perfect Charity with you all : But Cuftom will prevail, and then I muft fhew what I can do in the Beginning of my Book, that my Readers may enter up-on the Defcription of my Engine with a good Opinion of my Skill ; tho' the main Reafon is, that, without Animadverfions upon the Attempts of others, I could not fwell this to a Six-penny Book, unlefs I had em-bellifh'd the Recommendation of my Device with fine Metaphors, and clever Comparifons ; quoting the Scripture in one Place, and the Poets in another ; or filling up Voids with Paffages taken out of the Apo-ftolical Conftitutions. But I never had th: Knack of
fpeaking

speaking much, when I had but little to say. I might, indeed, with the Printer's good Management, have made four Pages of the Commiffioners Names in Capitals, and then have humbly fubmitted my Effay, *and fubfcrib'd myfelf* their devoted and obedient Servant *in two Pages more; which, with the Copy of the* Act of Parliament, *and* Title-Page, *would have made up one Sheet: An* Introduction *of* Aftronomical, Geographical, *and* Mechanical *Definitions, to fhew that I was Somebody, might have fill'd the next Sheet; and the Devil is in't if I could not have made fixteen Pages of my Movement; and fo, by the Help of* F I N I S *and* E R R A T A, *compleated my three Sheets. But then I confider'd, (fince I am fure of being right) that it was my beft Way to go to Sea firft, and give the Mariners fuch Ocular Demonftration of my Contrivance, that I fhall have a fufficient Number of Witneffes of my Succefs, to vouch the Account of which I fhall, at my Return, lay before the Commiffioners, and fo carry off the* twenty Thoufand Pounds. *As for the Introduction, I fhould have thought it very ill Manners, to begin my Book, as if I meant to teach Firft Principles to thofe Learned Philofophers by whom I am to ftand or fall. If it be afk'd, why I wrote the Book at all, I'll frankly anfwer,* That I wanted Money ; *and that if I had thought that the Commiffioners would have been prevailed upon to have given me fome, to carry on Experiments, I had never fet Pen to Paper. For this very Reafon, I fhan't fay a Word about my New Invention, till its proper Place. And if the Bookfeller does not cut open the Sheets, whoever has a Mind to know what I drive at, muft buy the Book: Peeping in, won't do; for I fhan't begin a Paragraph with the Defcription of my* Curiofities, *or write the Names of any of my* Machines *in* Italick Characters. All that

E 2

*I shall say here, is, That I have try'd all my Experiments at Land, with desir'd Success, and as soon as the Bookseller has paid me, I'll go to Sea; and if, after all, I fail in the Attempt, yet——*Vobiscum certasse juvabit. *I am, Gentlemen,*

<div align="center">

Your most devoted, most obedient,
and most humble Servant,

Jeremy Thacker, *Philomath.*

</div>

Well-wisher to the *Twenty Thousand Pounds.*

Advertisement concerning the Longitude.

"IT is now well nigh towards half a Year, since
" my good *Genius*, and *my Self*, found out
" a Method for discovering LONGITUDE, which I
" had publish'd before, had it not been on Account
" of the Creatures of *Trap* and *Discovery*, who, (I
" had Reason to fear) would have run away with
" *the Secret that Nature had confess'd to* ME, *and*
" *had refus'd to* THEM, *as otfen as they have ask'd*
" *her for it.* But now, that Things are so settled,
" that no Body can rob me of the Benefit of my
" Invention, I publish this to defy all that can be
" done by those of the *Snearing* and *Grinning* Kind,
" in their proper Employment of *Ridicule* and *Gri-*
" *mace:* And therefore I expect all my Readers to
" be *Merry* or *Angry*, or *Grave* or *Serious*, upon
" this Occasion; but I must (and indeed I dare)
" submit myself to the *Multitude*, who, if I am
" not mistaken, will declare me a *Fool* or *Mad-*
" *man*, with *Pomp* and *Ceremony*, for being so po-
" sitive; and therefore I do, by Astrological *Cal-*
" *culation*, prognosticate, that some will *desire I*
                                                  " should

" *fhould be in the Wrong* ; others will have *a Sufpi-*
" *cion that I am in the Right* ; and the *Ignorant*
" will not know whether I am *Right or Wrong.*

Jeremy Thacker,

WHAT if the greateft Part of the Pack have
run upon a falfe Scent, may not the hind-
moft Dog hit it off? Perhaps, from my comparing
the *Seekers* after the *Longitude*, to a Pack of Hounds,
fome arch Wags will fay, that if one or two Dogs
run mad, it is ten to one but all the reft eatch the
Infection, and fo look upon him as a Mad-man; let
'em *fneer* on; for if I can but demonftrate myfelf
to be in the Right, and all the reft in the Wrong,
(as I am confident I can) their Laughing will be
turn'd into Admiration; and when I receive the Re-
ward, they'll fay, *Who wou'd have thought it?*

If I fhould follow the Example of the greateft
Part of the *Longitudinarians*, that wrote after the
firft Attempt, I fhould take Mr. *Whifton* and Mr.
Ditton in Hand, fhipwreck their *Hulls*, drown their
Sounds in a Tempeft, lift up the Waves to intercept
the Sight of their *Fires*, and break their *General
Peace*; but Gratitude forbids: They fprung the
Twenty Thoufand Pounds, and I hope to get it, I
ought to be civil to them. Then let Mr. *D.* reft
affur'd, that I will neither meddle with his *Longi-
tude*, nor his *New Law of Fluids*; and poor Mr. *W.*
has been fo often handled as a *Longitudinarian* and
a *Latitudinarian*, fo amaz'd at the Burfting of his
Mortar, and one of his *Shells*, and fo frighten'd
with the Fall of another *unlighted one*, that it would
be as barbarous as ungrateful for me to infult over

E 3   him.

him. No, I ſhall always own him the Maker of
my Fortune. I had no great Acquaintance, no
Friends at Court; I could by no Means have pro-
cur'd an Act of Parliament for my Encouragement:
My Engine was ready theſe three or four Years; ſo
I was glad when he ſtirr'd. I lay ſtill, well-know-
ing that he was beating the Buſh for me to catch
the Hare.

Before Mr. *Hobbs* thinks of ſending his Spring-
Movement to Sea, let him know how to make the
Month of *June* in one Year, juſt as hot as the ſame
Month in another, and ſo of every Day and Month
in all Years; then his Inſtrument will be equally
haſten'd and retarded at the ſame Seaſons; and then
he may poliſh his Pivots, and make an Ætherial Oil
that won't thicken and increaſe the Friction of his
Watch.

Mr. *Bill—y* (after having acquainted us with ſe-
veral *admirable* and *ſurprizing Phænomena* of Na-
ture, which he took for *Conjuring*, the firſt Time
he ſaw them, but now dares venture to perform
himſelf, (and by himſelf) very reaſonably tells us
That ſince the *Phoſphorus, Glaſs-Devils* in Water
&c. which would, to a Stranger, ſeem to be actu-
ated by Magic; to us that are wiſer, appear to b
the Effects of no other Arts, but *Chymiſtry* and *Le-*
gerdemain; his finding out the Longitude, after ſ
many have attempted it in vain, is a Thing n
ſtranger than it is true. His *Movement* is ſtill be-
hind the Curtain, but I'll think the beſt of it; an
ſince he has vouuchſafed to tell us, *That he will, b*
Means of a long Pendulum, have a ſteady Motion i
an irregular one, I'll help them out, and aſſur
him, that he will ſucceed, if he will do one Thin
more, and that is, — prove Sir *Iſaac Newton's* fir
Law of Motion to be falſe.

I b

I have little to fay to Mr. *Br——e*, the Corrector of the Moon's Motion; but if his Application of it be practicable for trying to find the Longitude, I'll turn him over to the Aftronomers, for the *Examination of his Theory*; and I would not be in his Cafe, if he fhould fall into the Hands of Dr. *John Keil*, who knows how to revenge the leaft Injury done to Dame Nature his Miftrefs, by the falfe Reports of bad Philofophers.

The Latitude, no doubt, may be exactly found by *Signior Al——ri* ; but if he would difcover the Longitude by his Machine, he fhould defire his Workmen to make him a long Leaver, not to *move*, but to *ftop* the *Earth* ; or if *Ptolemy* has done that for him already, let him fhove up his Leaver, and ftop the *Primum Mobile :* If he wants Help, Mr. *K--th* will lend him an Hand, and tell him what *Star* he fhall chufe for an *Eaftern* or a *Weftern Pole*. However, let not our *Italian* Gentleman be difcourag'd from giving us the Figure of his Engine ; for he is not the firft Profeffor of *Mathematics* that has fallen fhort of the *Longitude :* And though I can't commend his Scheme, becaufe I am his Rival in this Cafe, yet, if he'll try for the Philofopher's Stone, or *fquare the Circle*, I'll fubfcribe to it. And if *my Friend K-th* would have his Method effectual, let him take a Journey to the Moon, where he will be certain of his *Longitude* by his Obfervations of the impending Earth ; he may find a fufficient Number of *Ganza's* among the *Latitudinarians* to carry him thither, and the *Lunatick* Attraction between the *Moon* on the one Hand and himfelf and the *Ganza's* on the other, will make his Voyage fpeedy.

E 4

Mr. *J. H.* Writer of the Effay, has fuch a fer-
tile Brain at Invention, that I know not how to
deal with him :

————*He'll raife* Objections *dark and nice,*
  And after folve 'em in a Trice.

And if I demolifh one of his Movements, he'll
pop upon me in a Moment with another. If I tell
him, that the Mercury in his portable Barometer
with the fpiral Bafon, will vibrate ten or twenty
Inches by the very Shake of the Ship, becaufe the •
common portable one, which is ten or twenty
times lefs fenfible as to the Mercury's Rife and Fall,
will, with the leaft Shake, vibrate half an Inch)
he'll fubftitute Dr. *Hook's* Marine Barometer, and
have me there again : But then (granting him his
Theory of the Tides) he muft confider that the
Moon raifes a Tide in the Atmofphere, as well as
the Ocean ; and as he rifes from his Level with his
Barometer in hand, where he expects the Liquor to
defcend, he will find himfelf baulk'd, becaufe the
Height of the counterpofing Atmofphere, will not
decreafe in that Cafe, as it would do at Land.

But then the *Pendulum* in the *Center of the Gra-
vity of the Ship*, muft it not always vibrate? That
it will be in Motion all the while that the Ship goes,
I readily grant; but then it muft be in *abfolute Mo-
tion* ; for if ever the Ship goes fteady it will be at
relative Reft ; (that is, (in mechanical *Englifh*) at ·
Reft in Refpect of the Things about it in the Ship)
and therefore it will not move his Watch-Work. If
he would have this Inftrument go, let him con-
fult about it with the Inventors of a perpetual Mo-
tion ; * and for his Time-keeper by a *Vacuum*, let
    him

? He may hear of feveral at Birmingham *or* Sheffield.

him afkAdvice of that Metaphyfical Gentleman who
has wrote *a Book to difprove the Exiftence of Matter*.

I have feen no more Attempts for the Longitude,
except Mr. *Wa————n*'s Advertifement, wherein
he promifes a Clock to make the Longitude known
to thofe of the meaneft Capacity ; therefore fince I
think myfelf none of the Vulgar, the Expeꝗ̇ation
of his Wheel-Work fhan't delay my Book ; let the
Tars examine the Machine, and judge of it.

There is another Gentleman that has a great Vo-
lume coming out, for which he hopes to have the
Twenty Thoufand Pounds. His firft Page of the
Quarto fent before, (to tell the World that he is
coming) he dedicates to the KING, his next to the
PRINCE, the third to the *Royal Society*, and the
fourth to the Reader : So far I read of him ; for the
Language look'd like *Englifh*, and the Printer had
fhew'd himfelf a well bred Man in the Diftances of
the Lines, and Bignefs of the Letters, whofe Size
he proportion'd to the Quality of the Patrons. The
Body of the Book was wrote in a Language that
I could not underftand, and fo I muft fufpend my
Judgment, till I have fent it to be perus'd by my
learned Friend Mr. *Gr————n*, of *Cambridge*; for
this Book may contain fome of the Conclufions
which follow from the Principles of his new Phi-
lofophy.

In a Word, to put an End to all the Methods for
difcovering of the Longitude that have been pub-
lifh'd hereafter, (always excepting my own) there
are but two Ways by which it can be found, *viz.*
*By the Improvement of Aftronomy, or by the perfecting
of Clock-Work.*

It is to be hop'd that Aftronomy will foon be
carry'd fo far as to ferve for this Purpofe, unlefs the
great Mr. *L————*, with an Induftry equal to his
Candour, fhould join the *Fluxions* and *Series*, which

he

be invented, to his known Skill in the Laws of *Centripetal* and *Centrifugal* Forces, and fo vouthfafe to perform the Work for the Benefit of Mankind.

But if Aftronomy was much more improv'd, Telefcopes of a competent Length, for Obfervations of fuch a Nicety as is requir'd in this Cafe, would not be manageable at Sea, even tho' the Obferver fhould place himfelf in the Center of Gravity of the Ship, where there is the leaftMotion of al'; befides in foul Weather, when the Longitude is moft wanted, no Cœleftial Body would be feen, to make Obfervations.

What remains, is a *Time-Keeper*.

A long Pendulum-Clock meafures Time better than any other Machine whatever, at Land ; but it can by no Means be brought to do it at Sea with the fame Exactnefs, for the following Reafons :

1. Becaufe the Pendulum does not vibrate in a Cycloid.
2. Becaufe the circular Arcs which it defcribes, are, by the Motion of the Ship, made to be unequal, and therefore not *Ifochronal*, or perform'd in the fame Time.

It is demonftrated by Mathematicians, that if a Pendulum *(Fig.* 1.) fwings in a *Cycloid*, as APB, all its Swings or Vibrations, whether great, as APB, or fmall, as DPπ, are perform'd in the fame Time; but the Pendulum P being faften'd to the Center T of the *Semi-circle* F P G by the Thread or Wire TP, tends to fwing in the Semi-circle FPG, in which unequal Arcs are not gone thro' in the fame Time by the Pendulum. Some Clock-makers indeed have us'd *Cyclcidal Cheeks*, as AT and TB, to guide the Thread or Rod of the Pendulum ; but *the great Friction* between the Cheeks at T, and a-
again'

gainft 'em along A T and T B, has made the
Remedy worfe than the Difeafe ; and therefore Pen-
dulums have again been made to fwing in Circles ;
but the Thread or Rod of the Pendulum, being
made pretty long, and vibrating only fhort Arcs of
a large Circle, the Swings are Ifochronal, becaufe
the fmall Arcs of a Cycloid; and the fmall Arcs of
a large Circle,coincide. As for Example, if the Semi-
circle FPB be of about nine Inches Radius, and the
Pendulum defcribes nearly a Quadrate of it each Vi-
bration,asit will do in going from *a* to *b*, then theArc
defcrib'd, will run pretty much out of the Cycloid ;
but if the Radius of FPD, or what is the fame, the
Rod of the Pendulum, be four times as long as that
which is made ufe of to fwing Seconds, and the
Pendulum itfelf pretty heavy, it will fwing in the
Arc DPπ, where the Circle and the Cycloid are
fenfibly the fame Line ; and therefore if no Force
makes the Pendulum fly out farther than ordinary in
its Vibrations, they will be all perform'd in the
fame Time, becaufe then the Cycloidal Arcs are de-
fcrib'd. ·· ·· :·)

·· Now, at Sea the Motion of the Ship will caufe
the Pendulum to make large, and fometimes fmall
Vibrations : But if it be anfwer'd, That a Check
may be put to confine the Pendulum to vibrate in
the Arc Dπ ; I fay, That as much as the Spring or
Contrivance, which checks the Pendulum, is acted
upon by the faid Pendulum when it endeavours to
fly out beyond its Bounds, fo much Motion is there
added to the returning Pendulum, (becaufe the Ac-
tion and Reaction are always equal and contrary)
and therefore its Velocity is too much increas'd,
&c.

This will always remain an unconquerable Ob-
jection againft Pendulum-Clocks ; for two the
Ship

Ship fhould not roll, (which never was known) yet
ſuch a Clock would be uſeleſs : For, let us ſuppoſe
the Ship to go very ſteady, upon the leaſt increaſe
of the Ship's Velocity, the Pendulum will ſwing
fore or aft with too great a Force, as for Example
to *p*. If the Ship's Velocity be diminiſh'd, the Pen-
dulum ſwings from Side to Side, the rolling (which
we now conſider again) will by its Irregularity, pro-
duce the above-mention'd Effect; and this is all
built upon this certain Principle, *viz.* That all
moving Bodies, if acted upon by no extrinſecal A-
gent, always continue in their State of Motion :
So the Pendulum, which, together with the Ship,
was going forward with a determinate Degree of
Velocity, continues to go on with the ſame Velo-
city, even when that of the Ship is diminiſhed, and
ſo flies out too far, *&c.* And ſo likewiſe the con-
trary happens, if the Ship is accelerated, *&c.* the
Pendulum either making too long, or too ſhort Vi-
brations.

I take no Notice of the lengthening of the Pen-
dulum-Rod by Heat, and its contracting by Cold,
becauſe that may be rectified by a Thermometer,
and the Pendulum may be ſhortn'd, as you approach
the Æquator by a Table of the different Lengths
requir'd to ſwing Seconds in different Latitudes.

What I propoſe therefore, is, a Spring-Move-
ment.

Methinks I hear Mr. *H*——*bs* anſwer, That
I rob him of his Invention: But let us come to the
Deſcription of mine, and then let my Readers judge;
*but firſt take the ſeveral Steps that I made, before I
came to a Certainty.*

It is ſome Years ſince I thought the Matter fea-
ſible, conceiving that if I could by an exact Time-
keeper

keeper, find in any Part of the World, what a
Clock it is at *Dover*, or any other Place affign'd, and
at the fame Time what a Clock it is where the Ship
is, theProblem was folv'd; therefore I was refolv'd to
fpare no Pains and Coft to bring Clock-work to
Perfection. When firft the Pivots in Watches were
made to go in Gems, I was refolv'd to try what that
would do ; but after having us'd Diamonds, I found
that the Pivots would run in highly hammer'd Brafs,
almoft as well; but upon fecond Confideration, I
imagin'd that the Difficulty of polifhing the Infide
of the Hole in the Diamond, was the Caufe that I
had fail'd of Succefs : Then I try'd Rubies, which
I eafily drill'd and polifh'd, and then they fucceeded
beyond Expectation ; for my Pivots being very hard,
and very little Oil put in at firft, I found the Oil was
gone in a little Time, being as it were fuck'd into
the Stone ; but the Movement went then as regular
as before. One of my Watches was about five In-
ches Diameter, and inftead of a Spring, I apply'd a
long Pendulum, and it went four Years without dif-
fering above 3, 4, or 6 Seconds from the fydereal
Time; but the great Difficulty was, how to make
a Spring and Balance perform the fame as a Weight
and long Pendulum, which I thus found out, after
having almoft given over the Thoughts of it. I
knew by Experiment, that the Pendulum-Rod was
by almoft $\frac{1}{20}$ of an Inch longer in the greateft Heat
of Summer, than in the coldeft Winter Weather,
and therefore kept a Table of Æquation to correct
the Error. This made me imagine, that the Irre-
gularity of the Spring, (which I fometimes fub-
ftituted, inftead of the long Pendulum) was not fo
much owing to a Defect in the tempering of it, as
to the Alterations made by different Degrees of Heat
and Cold. Accordingly, taking a Spring, made in
$\bullet$ the

the Manner reprefented in *Fig.* 2. and fixing it to
the Board FGHE ; fo that one End was faft to the
Nail A, and the other loofe with a Weight hanging
at it as B, I found that upon the Scale behind it FH,
the Weight defcended in hot, and afcended in cold
Weather ; fo that Heat not only lengthen'd, but
weaken'd my Spring, and Cold contracted it, and
added to its Elafticity.   It was in *December* that I
try'd my Experiment, and hanging my Board with
a Thermometer by it in a Green-houfe, I made it,
from the Coldnefs of the Weather, gradually to
fuftain Heat, which I increas'd 'till it became greater
than the greateft in Summer, fo as to reach and
exceed that in any Latitude, and thereby had a new
Thermometer made of the Spring.   I try'd feveral
Springs this Way, and made a Spring-Movement
with Springs thus try'd, and alfo apply'd 'em to my
above-mention'd Clock, (which has gone four Years
without any Oil, that which was us'd at firft feem-
ing dry'd up) inftead of Weights, and a Balance in-
ftead of the Pendulum, in fuch Manner, that all
the Wheels ftood vertical, that the Friction might be
equal on the Pivots. I made this new Watch fuftain
all the Degrees of Heat and Cold, as it had before
done when fingle, and made an Æquation-Table,
by the Help of the Thermometer, as mention'd be-
fore, to correct the Time, always fuffering the Ma-
chine to take its Courfe.   I likewife try'd what Ef
fect Moifture and Drynefs had upon this Movement,
by making a Steam in the Room, with a large Veffel
like one of Mr. *Savery*'s Boylers, and fucceffively
dropt cold and warm Water upon my Wheels,
which I found to caufe a confiderable Irregularity on
the Watch, tho' it did not feem to affect the Spring
fingly, unlefs according as the Vapour was hot or
cold. I made no Table to fettle the Matter of the
Moifture

Moifture and Drynefs, becaufe I keep my Machine
in a Vacuum, and can wind it up without letting in
the Air, as will appear in its Defcription. All that
I am to do at Sea, is, to keep it as perpendicular as
I can, that the Axes of the Wheels may be horizon-
tal ; but the Want of that now and then, can caufe
no great Error, efpecially fince I fufpend it like the
Compafs in concentrick Circles, and fix the whole
to the Center of Gravity of the Ship.

The Way that I compar'd the going of my Wat-
ches with the true Time, was this : I made an Hole
thro' a Wall about half an Inch Diameter, and up-
on the Gable End of an Houfe, at fome Diftance,
fix'd a ftrong Iron made in the Shape of DE, (*Fig.*
3.) fo that looking thro' the whole in my Wall, and
the Slit D in the Iron, I could fee the *Bull's Eye* in
the Slit ; and when I could fee the Bull's Eye again
the next Night in the faid Slit, I call'd that a fy-
dereal Day, with which comparing my Machine as
oft as the Darknefs and Clearnefs of the Night
wou'd permit me, I found it not to vary above 6 Se-
conds. I muft, by the by, take Notice, that I cou'd
not by this Contrivance find any fenfible Parallax of
the fix'd Stars, whether I look'd with the naked Eye,
when the Star feem'd to fill the whole Slit in the
Iron, or with a fmall Telefcope, when ceafing to
twinkle it appear'd like a lucid Point in the Mid-
dle of the faid Slit.

Here follows the Defcription of my Time-keeper.
(*See Fig.* 4.)

. HIKL *is the Movement, with its vertical Dial-
Plate, and its three Hands,* viz. *Hour-Hand, Mi-
nute-Hand, and Second-Hand, fix'd to the horizontal
Brafs Plate* MN.

MXAECXM *is a Glafs Receiver from which the
Air is drawn out at the Paffage* E, *which has a Valve
to apply an Air-Pump or Syringe to, and then a Brafs*
<div align="right">Head</div>

*Head to screw over the Valve and more firmly hinder
the Return of the external Air ; but yet so as it may
be taken off to apply the Syringe at any Time, if any
Air shou'd have insinuated itself into the Receiver ;
but to secure it, there is a wet Piece of Sheep's Lea-
ther on the Brass Plate, which is always kept moist by
Means of Water that lies constantly on the Plate be-
tween the Receiver and the Brass Rim* MN *made high
for that Purpose.*

A *is a Brass Collar full of oil'd Leathers, thro'
which a Key passes, to wind up the Movement at* G,
*in such manner, that no Air shall pass in whilst the
Clock is winding up ; and that the winding up may not
stop the Movement, thro' the Collar* C *slips another
Key, to give Liberty to a Spring at* F, *which keeps the
Watch going, whilst the other Key winds it up.*

XX *is the Rim of the Brass Cap of the Receiver,
which rises so high as to hold Water to keep moist the
oil'd Leathers of the Screws of the Collars* A *and* C,
and of the Screw at E.

At M *and* N *are two Ends of an Axis for the
Movement, Receivers, and Plate to run freely in the
strong Brass Hoop* POQ, *which likewise, by means
of the Iron Point* QT, *and another (which is here
suppos'd behind the Machine) moves in the other Brass
Hoop* RST*) which last Hoop has four strong trian-
gular Plates, three of which appear in the Figure) by
means of which the whole Engine is to be screw'd fast
at or near the Center of Gravity of the Ship.*

VVWW *is a Weight of Lead so fix'd to the
Plate on which the Movement stands, as to keep the
Watch always perpendicular, or at least to bring it
back to a vertical Position, when it is shak'd out of it;
for our Watch is not accelerated or retarded by the mere
shake out of a perpendicular Position, but by lying so
long in another Position, as to have one End of the*
                                                    Axe

Axes of the Wheels suffer more Friction than the o-ther.

By means of the *Glass Receiver*, the *Watch* is kept from being affected with the *Moisture and Dryness of the Air.*

And the *Thermometer*, which is always to be near the *Movement*, shews, by Help of my *Table*, when the *Work* goes too fast, or too slow, and how much too fast, or how much too slow.

As for my Method of knowing what a-Clock it is at the Place where the Ship is, I shan't trouble my Reader with it, 'till I come back and mention it in the Memorial which I shall present to the Commissioners, and prove by Witnesses; for that is a Postulatum to a *Longitudinarian*, and I don't know one of 'em who makes any Difficulty of it.

Now, gentle *Mechanico-Mathematical* Reader, I humbly submit to thee, and leave thee to judge, whether or not my Method will do for finding the *Longitude* at *Sea*, and whether all those that have been hitherto publish'd do not much fall short of mine.——————
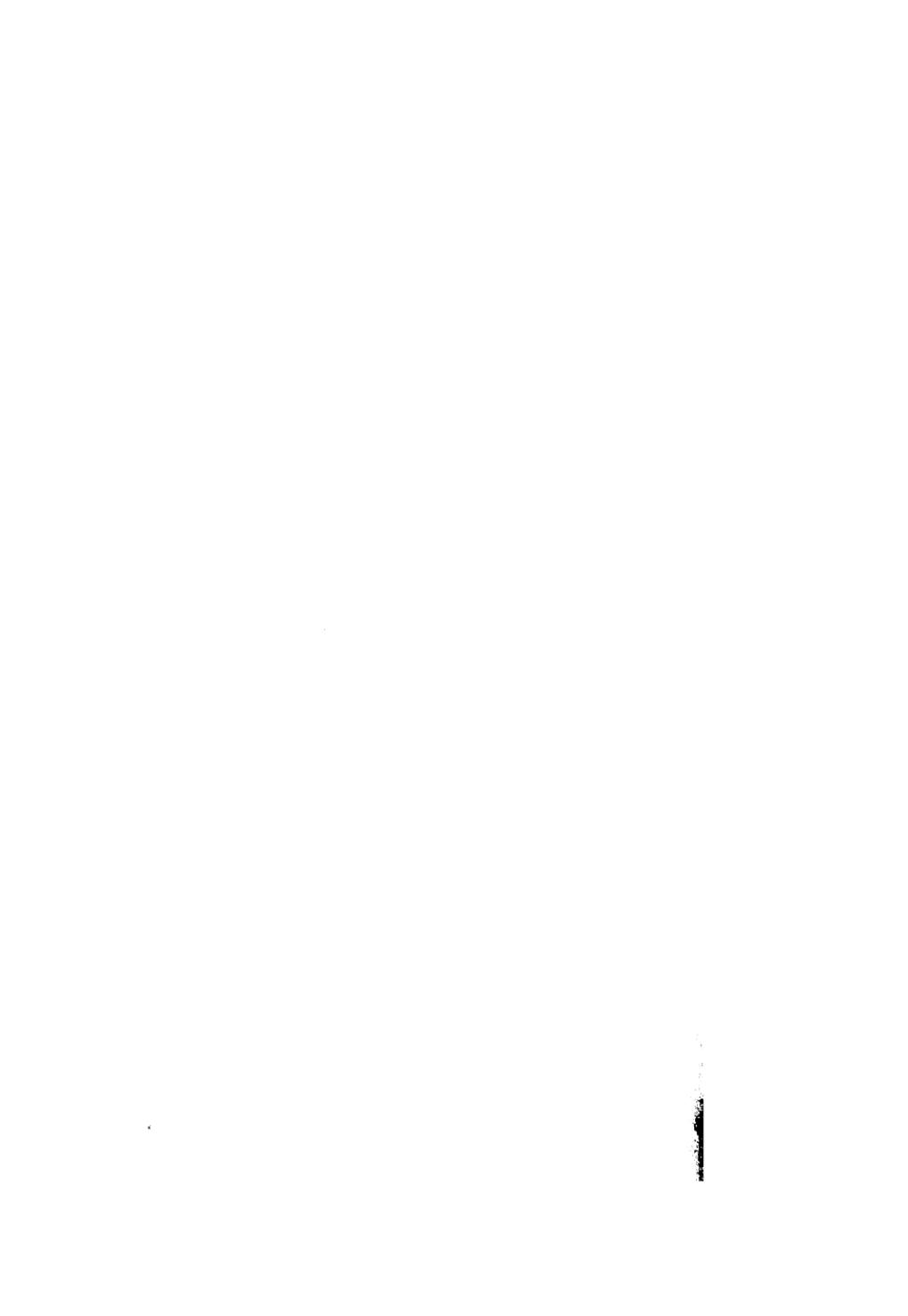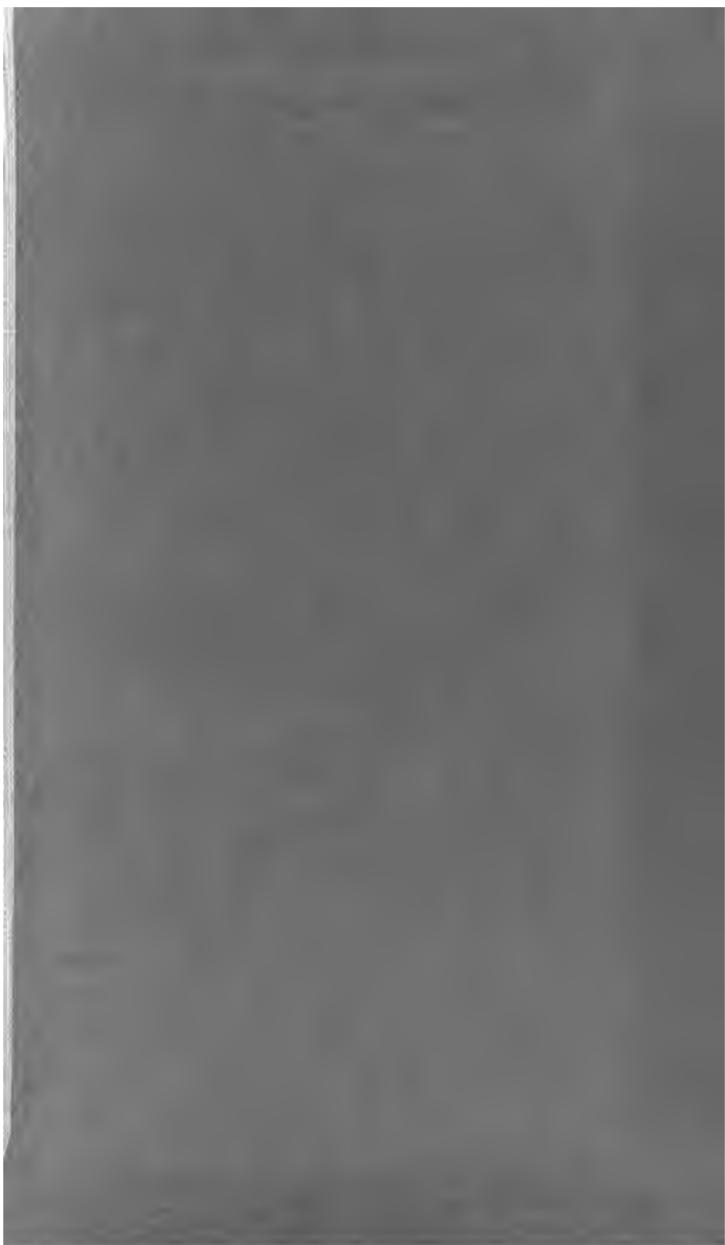
Lenta salix quantum pallenti cedit olivæ.

Jamq; Opus exegi——————

F I N I S.

EN HM